Okanogan and Wenatchee National Forests Roads Analysis: Tonasket Ranger District

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Introduction

Over the past decade, because of a national shift in environmental awareness, roads and road issues have become points of controversy. Roads are being scrutinized for their impact on ecosystems. Also, the funding available to maintain roads has decreased significantly. There is an urgent need to find a balance between the need for access and the potential environmental risks of a deteriorating road system. To meet this goal, the Okanogan and Wenatchee National Forests conducted a forest-wide road analysis.

The objective of the road analysis was "to provide line officers with critical information to develop road systems that are safe and responsive to public needs and desires, are affordable and efficiently managed, have minimal negative ecological effects on the land, and are in balance with available funding for needed management actions" (USDA FS 1999). This analysis is not a decision-making process. It will develop strategies and recommendations that will be incorporated into future project-level decision-making analysis.

The following analysis is a science-based interdisciplinary process using existing information and inventories. The analysis addresses the effects of roads on biological, social, and economic factors. The condition of the current road system was analyzed in terms of desired conditions, which includes amount and type of access, and impact and risks to the ecosystem. This analysis identifies opportunities and strategies for moving toward the goal of an affordable, efficient road system that meets the needs of the public and the U.S.D.A. Forest Service with minimal impact to the environment. The analysis includes previously completed plans, analysis and decisions.

This analysis is based on the objectives and guidelines in "Road Analysis: Informing Decisions about Managing the National Forest Transportation System," developed by the Forest Service Chief's Office in Washington, D.C. (USDA FS 1999). The guidelines present six steps that each analysis should complete. The six steps are:

Step 1: Setting up the analysis
Step 2: Describing the situation
Step 3: Identifying issues
Step 4: Assessing benefits, problems and risks
Step 5: Describing opportunities and setting priorities
Step 6: Reporting of recommendations to the Line Officer

The analysis of the Wenatchee Sub-Basin is a modified version of a process developed by the Umpqua National Forest and presented in "Upper Steamboat Creek Watershed Analysis: Access and Travel Management Planning Process and Results." The process was modified to reflect characteristics and situations present on the Okanogan and Wenatchee National Forests and incorporates the six steps listed above.

This is the first of a three-phase process to analyze all the roads on the Okanogan and Wenatchee National Forests. The second phase will be at the watershed scale: all roads within the watershed will be considered. The third, final phase will be at the specific project scale. The first two phases (sub-basin level and watershed level) develop recommendations, and are not decision

documents. The final phase, at the project scale, will be at the decision-and-implementation level.

The analysis process examines the major arterial and collector roads within the sub-basin. The roads were segmented according to their maintenance level and the watershed in which they are located. After the roads were segmented, they were rated on criteria in three modules: Human Use, Aquatics, and Wildlife. The Aquatic and Wildlife modules document the effects of roads on biological factors; the Human Use module addresses the effects of roads on the social and economical factors. The specific criteria in each module are described in the appendices; the five maintenance levels are described in Appendix F.

Each module developed a "High," "Moderate," or "Low" rating for each road segment. The three ratings were used to develop a recommended management strategy for that road segment. The management strategy options ranged from major improvements to some form of decommissioning.

Each watershed within the sub-basins was given an overall rating for each module. This rating was used to develop the recommended priorities and sequence for conducting the watershed scale of the roads analysis process.

1. Information from the completed sub-basin road analysis will be used in several ways: The compilation of the sub-basin level analyses will contribute to the comprehensive forest-wide road management strategy.
2. More detailed watershed-scale analyses will tier to the sub-basin data and recommendations.
3. Scheduled Land and Resource Management Plan (Forest Plan) revisions will use the analyses results in setting long-term management direction for the road system across the three forests. The forest plan revision is scheduled to begin in the spring of 2003.

I. Existing Conditions and Situation

This analysis focuses on the major arterials and collectors (roads open and maintained for passenger car use) within the Tonasket Ranger District. For more information, see the vicinity map (Figure 1) and the analysis area map (Figure 2).

The Tonasket Ranger District manages land within sub-basins and 12 fifth-field watersheds. Because the portion of the Methow Sub-Basin managed by the Tonasket District is included in the sub-basin summary from the Methow District (USDA FS 2002), it is not discussed in this document. The following areas were included in the analysis:

The Okanogan Sub-Basin, which includes

- Bonaparte Creek Watershed
- Antoine-Siwash Watersheds
- Salmon Creek Watershed
- Tonasket Watershed
- Southeast Okanogan Watershed

The Similkameen Sub-Basin, which includes

- Similkameen River Watershed

The San Poil Sub-Basin which includes
- West Fork San Poil Watershed
- West Fork Granite Watershed

The Kettle Sub-Basin which includes
- Toroda Creek Watershed
- Myers Watershed

The area of the sub-basin being analyzed is 363,132 acres, of which 198,766 acres (50%) are in wilderness and inventoried roadless areas. The area contains approximately 1,212 miles of classified Forest Service roads (FSRs), of which 180 miles of major arterials and collectors were analyzed. The remainder of the collectors, local roads, and unclassified roads were not considered in this analysis. The remainder of the system roads and known unclassified roads will be analyzed during the second phase of roads analysis which is scheduled for 2003–2004.

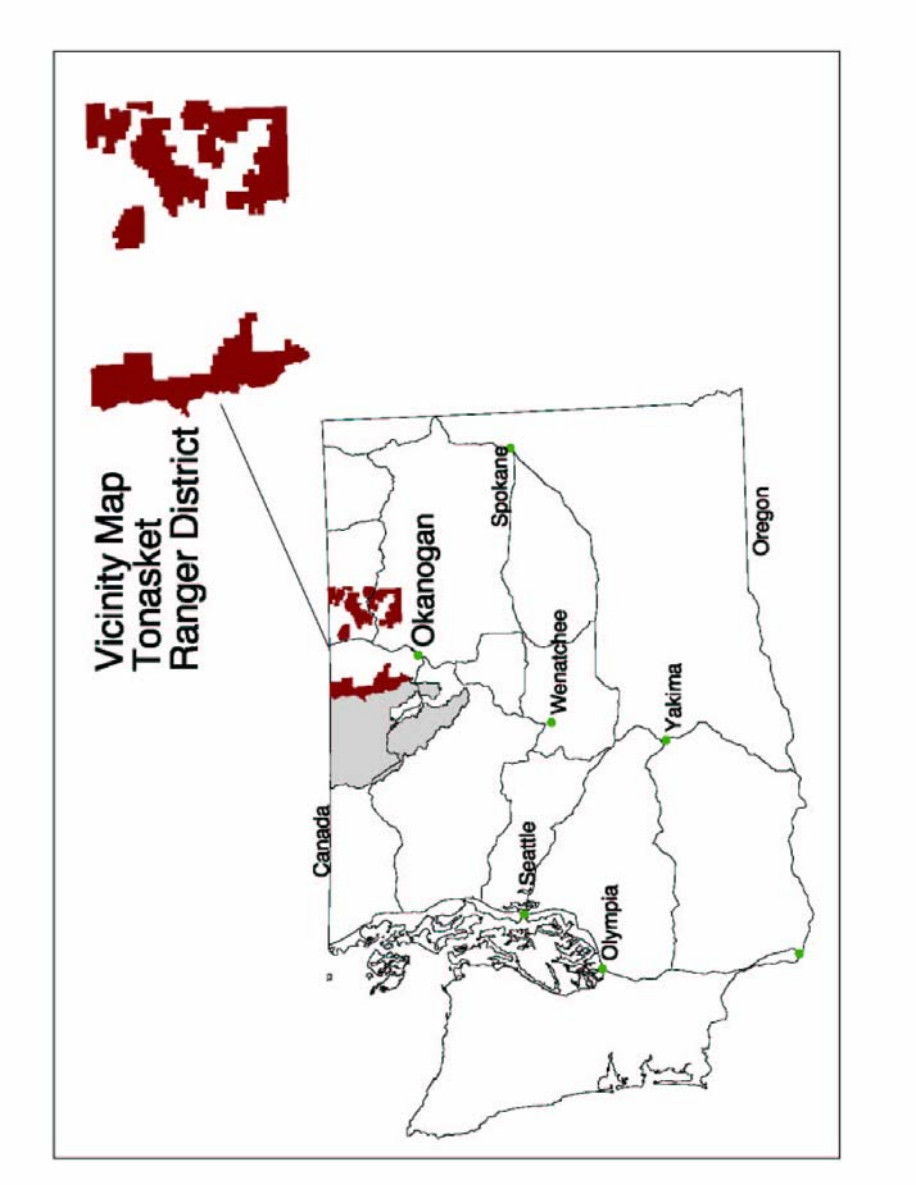


Figure 1. Tonasket Ranger District Vicinity Map

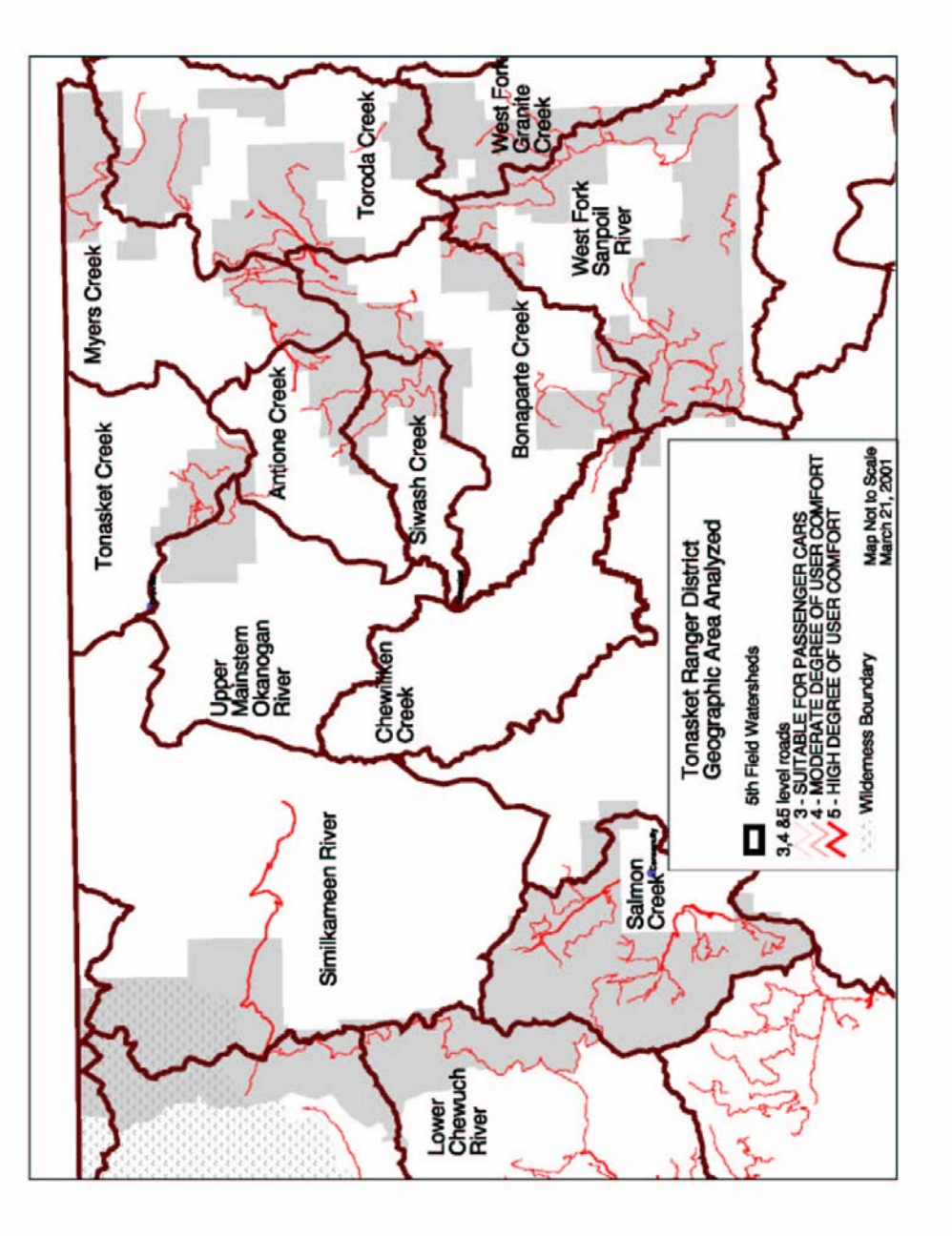


Figure 2. Geographic Area Analyzed on the Tonasket Ranger District

I. Existing Conditions and Situation

General Conditions

A. Roads

The entry of non-indigenous peoples to the Okanogan Valley before the early 1900s was largely related to exploration and the fur trade. Travel was by foot or horseback and probably followed established native trails. As settlement continued, roads were constructed.

Many early forest roads were established as stock driveways or for mineral extraction. By the 1950s most new roads were being constructed for timber harvest. In time, the demand for forest products increased, as did the need for additional roads. Equally as important as an economic element was the increasing interest in recreation and the recreation opportunities forest roads provided. Among these recreation opportunities are access to trails, boating activities, developed campgrounds, dispersed camping sites, and access to motorized recreation opportunities for off-highway vehicles, motorcycles, ATVs, and snow machines. Access to the area was increased by roads constructed by the public ("user-built roads") and termed "unclassified" by the U.S.D.A. Forest Service.

Today, State Routes 97 and 20 pass through the Okanogan River Sub-Basin. State Route 97 follows the Okanogan River, and State Route 20 travels west and east from the valley floor. County and Forest Service roads (FSRs) leave the highways to provide access to the forest lands within the District.

Road-associated effects to the environment are also included in this analysis. Throughout the sub-basin the combination of road location, road surface type, and high public use patterns in the wetter times of the year, produces a higher potential for increased road surface damage and sediment production. This is particularly evident on the native-surfaced roads that are extensively used during hunting season. In many cases, this combination of conditions results in rutted or wheel-track damaged roads. For the purposes of roads analysis for the Okanogan River Sub-Basin, the Forest Transportation Management System (INFRA Roads database) describes each system road or road segment by assigning values that describe the way the road serves resource management needs and the specific maintenance required, consistent with management objectives and maintenance criteria. In the past few years, the emphasis has been on gathering road-related data within projects, such as inventorying and mapping unclassified roads, identifying the backlog of deferred maintenance work, and surveying road culverts which may be a problem for fish passage. Information provided by these and other projects will be included at some level of the roads analysis process. A summary of the forest road miles in each watershed by road type and maintenance level is available in the analysis file. For a description of the five maintenance levels, see Appendix F.

B. Aquatics

The lands managed by the Tonasket Ranger District are located in watersheds that flow into five

sub-basins: the Okanogan, San Poil, Similkameen, Kettle, and Methow. These five sub-basins total 10,018,329 acres. The Tonasket Ranger District, shown in dark gray (green) in Figure 3, is responsible for managing 4% of this land.

The portion of the Methow Sub-Basin managed by the Tonasket District is included in the sub-basin summary from the Methow District and is not discussed in this document.

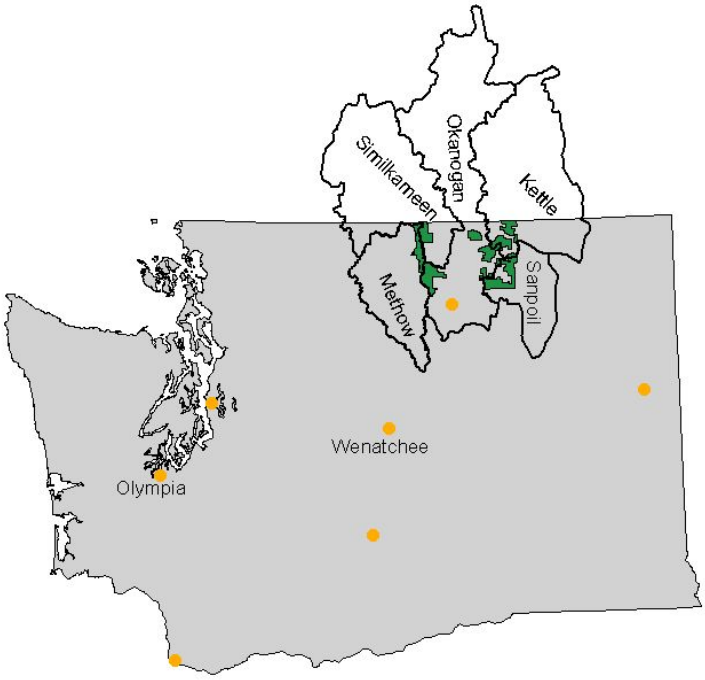


Figure 3. Lands managed by Tonasket Ranger District in sub-basins

Upper Columbia summer steelhead, federally listed as endangered, are found in the Okanogan and Similkameen sub-basins.

Columbia River bull trout are believed to have been extirpated from the Okanogan, San Poil, and Kettle Rivers (50 CFR Part 17 June 10, 1998). In Canada, bull trout are found in the Columbia River system but are absent in the Kettle, Similkameen, and Okanogan river systems (Cannings and Ptolemy 1998).

Spring Chinook (*Oncorhynchus tshawytscha*) were listed as endangered within the Upper Columbia River Evolutionary Significant Unit (ESU) by the National Marine Fisheries Service (NMFS) effective 24 May 1999. In the Final Rule for Determination of Status (Federal Register, 1999), the Okanogan River was specifically excluded from the listing without comment, though it is safe to presume the Okanogan is exempt because of the high water temperatures and lack of water due to irrigation withdrawals that occur during the spring chinook spawning and egg incubation periods. Because of these conditions, eggs and fry do not survive. The Okanogan River may also have been exempt because of the collection of all spring chinook upstream

migrants at Wells Dam. The adult spring chinook are then taken up the Methow River drainage for spawning and the young are raised in hatcheries there. The young are released to the Methow River from the hatcheries. Wells Dam is 17.7 miles downstream of the confluence of the Okanogan River with the Columbia River. Historically, spring chinook were known to be in the Salmon Creek and Omak Creek watersheds, as well as in the mainstem Okanogan River in the late 1800s and early 1900s.

Joint road assessment for the Kettle and San Poil sub-basins with the Colville National Forest should be done as Colville National Forest manages much of these sub-basins. In this document only the watersheds that the Tonasket Ranger District manages is reported. When inconsistencies in fish species composition arise, information from the Colville National Forest should be used.

Three sub-basins (the Kettle, Okanogan, and Similkameen) drain the southern parts of the Interior Plateau and the Monashee Mountains in Canada. Data from Tom Shuhda, Forest Fish Biologist on the Colville National Forest (Shuda, personal communication 2002), and in the Region 3-Columbia section of Freshwater Fishes of British Columbia (McPhail and Carveth 1994).

Table 1 summarizes findings for sub-basins and watersheds that contain lands managed by Tonasket Ranger District (the exception is the Methow River Sub-Basin addressed in the roads analysis for the Methow Valley Ranger District).

Okanogan Sub-Basin

The Okanogan Sub-Basin drains 3,062,851 acres. The Tonasket Ranger District, shown in dark gray (green) in Figure 1, manages 5% of this land.

Upper Columbia steelhead, an endangered species, summer chinook salmon, and sockeye salmon (neither of which is federally listed) are found in the Okanogan River. The Okanogan River and its tributaries up to natural upstream migration barriers have been designated critical habitat for steelhead. Columbia River bull trout are believed to have been extirpated from the Okanogan, San Poil, and Kettle Rivers (50 CFR Part 17 June 10, 1998).

The Colville Confederated Tribes and Washington Department of Fish and Wildlife have had a large sockeye supplementation program implemented as mitigation for the construction of Wells Dam.

Beginning in 2001, the Colville Confederated Tribes began a supplementation program for spring chinook, using rearing ponds along the Okanogan River and in Omak Creek. Carson stock that are surplus to the needs of the spawning/rearing programs at the State and Federal hatcheries in Winthrop are used. This supplementation program is expected to be in place for approximately five years. The numbers of fish stocked annually will vary depending on the returns each year, and the needs of the programs at the Winthrop hatcheries (Fisher, personal communication, 1998).

Six watersheds on the Okanogan and Wenatchee National Forests are included in the Okanogan Sub-Basin: Salmon, Southeast Okanogan (Tunk, Chewiliken), Bonaparte, Antoine-Siwash, and

Northeast Okanogan (Tonasket).

There are no significant fish species in the Southeast Okanogan (Tunk, Chewiliken) Watershed. The road management effects are not carried down to the significant fisheries in the Okanogan River. These watersheds are rated but no narrative is given. Bull trout were known to have been in Loup Loup Creek (Williams, personal communication, 1995) in the stream reaches on lands managed by Washington Department of Natural Resources.

Within the Salmon Watershed isolated populations of rainbow/redband trout are present. It is likely that no gene flow has occurred naturally to these areas from the stocked lakes and streams downstream. It is possible that genetically these fish may be significant. No genetic work has been done on the redband/rainbow populations in Salmon Watershed. North Fork Salmon Creek was stocked above natural upstream migration barrier falls with what appear to be west slope cutthroat trout. These populations are considered significant and will be used to prioritize projects on the District.

No significant fish populations exist in the Southeast Okanogan (Tunk, Chewiliken), Bonaparte, Antoine-Siwash, and Northeast Okanogan (Tonasket) Watersheds on the Tonasket Ranger District.

Similkameen Sub-Basin

The Similkameen Sub-Basin drains 2,322,196 acres, primarily Canadian lands. The Tonasket Ranger District, shown in Figure 4, manages <2% of the land in this sub-basin.

The Similkameen Sub-Basin is that portion of the Upper Columbia Basin from the headwaters in the North Cascades downstream to the confluence with the Okanogan River. Fish species protected under the Endangered Species Act inhabiting the sub-basin are the Upper-Columbia steelhead (endangered). Other native salmonid species that are a management emphasis include summer/fall chinook salmon, sockeye salmon and redband/rainbow trout. The Similkameen River from the confluence with the Okanogan (river mile [RM] 0.0) to Enloe Dam (approx. RM 5.0) is designated Critical Habitat for steelhead. Spring chinook salmon are not currently present in this drainage but designated critical habitat for them is provided in the Similkameen River consistent with the steelhead critical habitat designation. (Federal Register 2000). Enloe Dam, built at the location of natural barrier falls on the Similkameen River, excludes anadromous fish to all watersheds above river mile 5.0. Columbia River bull trout are believed to have been extirpated from the Okanogan, San Poil, and Kettle Rivers (Code of Federal Regulations 1998). In Canada, bull trout are found in the Columbia River system but are absent in the Kettle, Similkameen, and Okanogan river systems (Cannings and Ptolemy 1998).

West slope cutthroat trout are present in the sub-basin, but were introduced (MacPhail and Carveth 1994). The native redband/rainbow trout are found in all watersheds within the sub-basin. The genetic make-up of these populations has yet to be determined. Many approved and unapproved fish stockings have occurred throughout the sub-basin and genetic mixing has occurred in many of the sub-watersheds.

The Colville Confederated Tribes and Washington Department of Fish and Wildlife have had a

large sockeye supplementation program implemented as mitigation for the construction of Wells Dam.

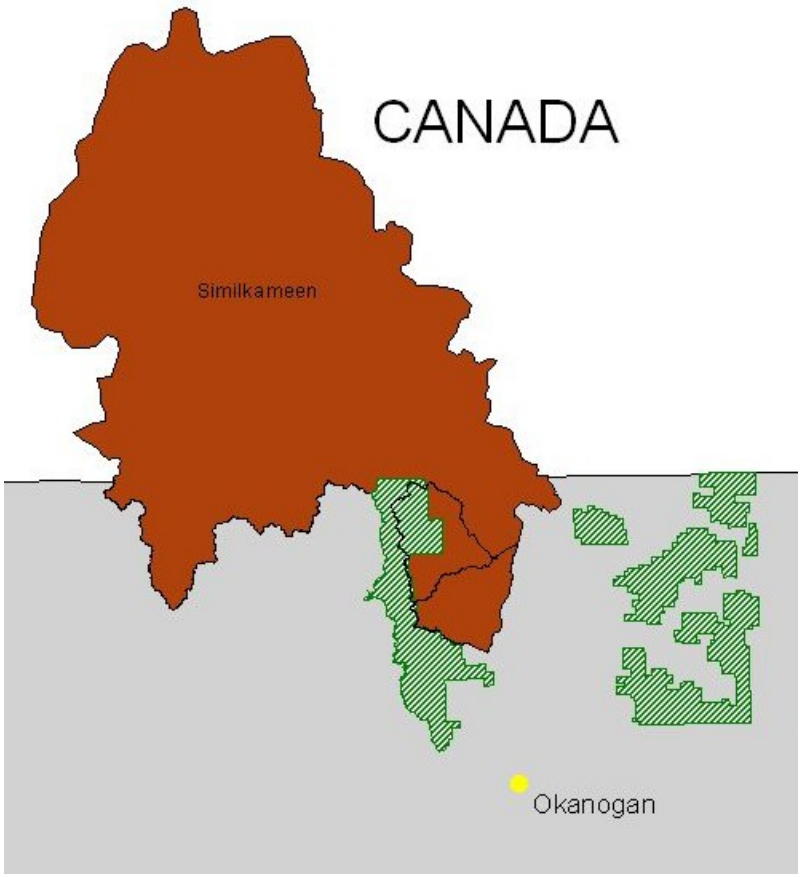


Figure 4. Similkameen Sub-Basin (U.S. and Canadian portions)

Beginning in 2001, the Colville Confederated Tribes began a supplementation program for spring chinook, using rearing ponds along the Okanogan River, and in Omak Creek. Carson stock that are surplus to the needs of the spawning/rearing programs at the State and Federal hatcheries in Winthrop are used. This supplementation program is expected to be in place for approximately five years. The numbers of fish stocked annually will vary depending on the returns each year, and the needs of the programs at the Winthrop hatcheries.

Three "managerial" watersheds on the Okanogan and Wenatchee National Forests are included in the Similkameen sub-basin: Ashnola, Similkameen, and Pasayten Watersheds. The U.S. portions of the Ashnola and Pasayten Watersheds are wholly contained in the Pasayten Wilderness. No roads are present and no road management occurs within the U.S. portions of these watersheds. They are omitted from further discussion.

San Poil Sub-Basin

The San Poil Sub-Basin drains 829,362 acres. The Tonasket Ranger District, shaded in dark gray (green) in Figure 3, manages 10% of this land.

The construction of the Grand Coulee Dam eliminated anadromous fish from the San Poil Sub-Basin. Columbia River bull trout are believed to have been extirpated from the Okanogan, San Poil and Kettle Rivers (50 CFR Part 17 June 10, 1998). Bull trout have been found in Roosevelt Lake but there is no population of bull trout in the San Poil River. Eastern brook trout are found throughout the sub-basin. Various stocks of rainbow and cutthroat trout have been planted in the lakes and streams of this sub-basin. These stocks have influenced the genetics of the resident redband populations in most areas. One population of west slope cutthroat trout has been found on the Colville National Forest (Shuhda, personal communication 2002).

According to James L. Priest, Fish and Wildlife Biologist for the Colville Confederated Tribes (Priest, personal communication),

> The West Fork Granite Creek flows into the San Poil and eventually to the Lake Roosevelt Reservoir. The [(Colville Confederated] Tribes manage a rainbow trout and kokanee salmon fisheries within the San Poil Drainage and are very concerned about water quality/quantity and habitat conditions. These are replacement fisheries to mitigate for lost anadromous runs as a result of hydropower development. This fisheries is important not only for Tribal members but is a primary source of recreation fishing for Lake Roosevelt anglers as well.

Two watersheds on the Okanogan and Wenatchee National Forests are included in the San Poil Sub-Basin: West Fork Granite and West Fork San Poil.

In the San Poil Sub-Basin, the Sweat and Maple Sub-Watersheds of West Fork Granite are considered significant, as is the Aeneas Creek Sub-Watershed of West Fork San Poil, due to what appear to be pure redband trout. Genetic analysis has not been completed on any of the populations. Even so, these three sub-watersheds are considered significant for redband trout and were treated as if these populations were part of an at-risk species because of the small population size, limited and isolated nature of the populations and habitat, and these populations may be the last remnants of the native populations. The subsistence fisheries of rainbow trout and kokanee of the mainstem San Poil River are significant fish populations.

Kettle Sub-Basin

The Kettle Sub-Basin drains 2,596,418 acres. The Tonasket Ranger District, shaded in dark gray (green) in Figure 3, manages 3% of this land.

The construction of Grand Coulee dam eliminated anadromous fish from the Kettle Sub-Basin. Columbia River bull trout are believed to have been extirpated from the Okanogan, San Poil and Kettle Rivers (50 CFR Part 17 June 10, 1998). In Canada, bull trout are found in the Columbia River system but are absent in the Kettle, Similkameen, and Okanogan river systems (Cannings and Ptolemy 1998). Bull trout have been found in Roosevelt Lake but none are found upstream of Cascade Falls, river mile 26, in Canada or the U.S. Eastern brook trout are found throughout the sub-basin. Redband/rainbow trout are found upstream of these falls; the Colville National Forest has identified four populations of interior redband trout in the Kettle Sub-Basin. Various stocks of rainbow and cutthroat trout have been planted above Cascade Falls in the U.S. and Canada. These stocks have influenced the resident redband populations in many areas.

Two watersheds on the Okanogan and Wenatchee National Forests are included in the Kettle Sub-Basin: Toroda and Myers.

In the Kettle Sub-Basin, within the Toroda Watershed, studies have found a genetic admixture of coastal and interior rainbow trout in Nicholson and Marias Creeks (Behnke and Proebstel, 1992). Cougar Creek has a relatively isolated population of rainbow/redband trout. Genetic purity has not been determined. Due to distance from stocked lakes and the Kettle River, it is possible that genetically these fish may be significant. A more isolated small population of rainbow/redband trout exists in Tributary 1 (T1) to the West Fork Cougar Creek. It is likely that no gene flow has occurred naturally to Cougar Creek or to T1 to West Fork Cougar Creek from the stocked lakes and streams downstream. This is not to say that people have not brought fish from these streams and lakes in buckets to "help" these populations. No genetic work has been done on the population in T1 to West Fork Cougar Creek or in Cougar Creek.

No significant fish populations exist in the Myers Watershed.

Current conditions are described and watershed scores developed using the Roads Analysis rating factors (See Aquatic Assessment, Appendix B):

1. Fine Sediment,
2. Floodplain Function, Off-Channel Habitat, and Riparian Reserves,
3. Flow effects,
4. At-Risk Fish Populations

The Wetland and Wet Meadows rating factor is only used at the road segment level so is not discussed in the watershed condition section.

The Roads Analysis Aquatic Assessment weighs road segment effects heavier if the segment is in a sub-watershed with at-risk fish (species listed as threatened or endangered under the Endangered Species Act), and whether the sub-watershed was considered "significant" (MacDonald et al. 1996) for an at-risk species. Since there are no at-risk fish populations on the Tonasket Ranger District, the at-risk definition was adjusted to account for watersheds with an aquatic priority on the District.

Section 7(a)(2) of the Endangered Species Act requires all federal agencies to review actions authorized, funded, or carried out by them to ensure such actions do not jeopardize the continued existence of listed species. Furthermore, federal agencies are to consult with the National Marine Fisheries Service (anadromous fish) and the U.S. Fish and Wildlife Service (inland fish) on on-going and new activities that may affect a listed species. The Okanogan and Wenatchee National Forests prepare biological assessments to assess potential impacts of management activities. The biological assessment and subsequent consultation is conducted at the watershed scale. The basis for the biological assessment is "A Framework to Assist in Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Bull Trout Subpopulation Watershed Scale," prepared by U.S. Department of Interior, Fish and Wildlife Service (adapted from the National Marine Fisheries Service), February 1998 (U.S. Department of Interior, 1998). An important portion of the biological assessment is establishing the

environmental baseline for the watershed. In the baselines, various habitat and watershed features are rated as Functioning Appropriately, Functioning at Risk, or Functioning at Unacceptable Risk. The Fine Sediment, Floodplain Function, Off-Channel Habitat, Riparian Reserve and Flow Effects ratings in the Roads Analysis are based on the latest watershed biological assessment for a watershed, which is cited at the beginning of each watershed section. When available, new information obtained from recent monitoring was included in this analysis. The watershed score for each rating element is shown next to the element; the narrative gives the rationale for the score. A summary table of the sub-basin indicators is provided at the end of each sub-basin section.

C. Wildlife

This part of the roads analysis describes the current conditions on the Tonasket Sub-Basin, in order to develop an information base upon which decisions can be made regarding the management of roads and their effect on wildlife. The sub-basin analysis will then identify Maintenance Level 3-5 roads for management, prioritize watersheds for further analysis at the watershed scale based upon potential restoration needs for wildlife habitats, identify issues within watersheds, and establish the context for watershed scale roads analysis.

Roads definitions are from the grizzly bear core analysis process and have been in use for wildlife analyses for several years. These analyses can be used to address wide-ranging carnivores, late-successional associated species, riparian-dependent species, ungulates, and unique habitats. Table 1 summarizes road-associated factors that affect wildlife habitats or populations (Wisdom et al. 1999). The analyses address the terrestrial wildlife (TW) roads analysis questions, TW (1), TW (2), TW (3), TW (4), and ecosystem functions (EF) question EF (2) identified in "Roads Analysis: Informing Decisions about Managing the National Forest Transportation System," (USDA FS 1999). The analyses described in this document are an adaptation of the TW questions to better address the issues and conditions on the Okanogan and Wenatchee National Forests.

The following discussion describes the five elements of the wildlife analysis and then presents specific descriptions of important aspects within each watershed in the Tonasket Sub-Basin.

C1. Wide-Ranging Carnivores

Wide-ranging carnivores covered in this assessment that are known or suspected to occur within the sub-basin include the gray wolf (endangered), wolverine (petitioned for listing), lynx (threatened) and grizzly bear (threatened). Portions of the Tonasket Sub-Basin are located within the North Cascades Grizzly Bear Recovery Zone. Several studies have documented the effects of road-associated factors on carnivores and these are summarized in Table 1. No conservation strategies or recovery plans currently exist for wolverine or gray wolves. A conservation strategy for lynx has been completed (Ruediger et al. 2000) but does not address potential indirect effects of roads on habitat quality. For all of these species, areas that are relatively free of human access provide refugium that is important for their long-term viability (Weaver et al. 1996). The availability of these areas is based on the amount of core area using the assessment process and definitions provided in Puchlerz and Servheen (1998).

C2. Late-Successional Associated Wildlife Species

There are over 100 wildlife species on the Okanogan and Wenatchee National Forests associated with late-successional forest (USDA FS 1997d). Table 1 shows the road-associated factors that have been identified to affect these species. None of the lands that the Tonasket District manages falls under the Northwest Forest Plan Late Successional Reserve land allocation (USDA FS et al. 1994). Late-successional habitat is present on the Tonasket Sub-Basin; however, at this time late-successional species were not analyzed according to the current corresponding analysis module. An alternative method will need to be created for the watershed level analysis.

C3. Riparian-Dependent Wildlife Species

This group of wildlife species includes about 285 vertebrate species that are either directly dependent on riparian habitat or use these habitats far more than others (Thomas et al. 1979). Current management direction includes managing riparian areas and influence zones through a network of riparian reserves (USDA et al. 1994). Riparian reserves provide habitat for wildlife species and are also important in providing habitat connectivity between areas managed for late-successional habitats. Table 1 summarizes the road-associated factors that can affect riparian-dependent wildlife species.

Table 1. Road-associated factors that negatively affect habitat or populations of wildlife species (based on Wisdom et al.1999) and the wildlife species group for which effects of the road-associated factor has been documented

Road-associated factor	Effect of the factor	Wildlife group affected
Hunting	Non-sustainable or non-desired legal harvest by hunting facilitated by road access.	Wide-ranging carnivores; Ungulates
Poaching	Increased illegal take of animals, as facilitated by roads.	Wide-ranging carnivores; Ungulates
Collisions	Death or injury resulting from a motorized vehicle running over or hitting an animal	Wide-ranging carnivores; Late-successional; Riparian dependent; Ungulates; Unique Habitats
Chronic negative human interactions	Increased mortality of animals (e.g. euthanasia or shooting) due to increased contact with humans, as facilitated by road access.	Wide-ranging carnivores;
Movement barrier	Interference with dispersal or other movements as posed by a road itself or by human activities on or near a road or road network.	Wide-ranging carnivores; Late-successional; Riparian dependent; Ungulates; Unique Habitats
Displacement or avoidance	Spatial shifts in populations or individual animals away from a road or road network in relation to human activities on or near a road or road network.	Wide-ranging carnivores; Late-successional; Riparian dependent; Ungulates; Unique Habitats
Habitat loss and fragmentation	Loss and resulting fragmentation of	Wide-ranging carnivores;

Road-associated factor	Effect of the factor	Wildlife group affected
	habitat due to the establishment of roads, road networks, and associated human activities.	Late-successional; Riparian dependent; Ungulates; Unique Habitats

C4. Ungulates

These species include mule deer, bighorn sheep, moose, and mountain goats. Current management is focused on maintaining or restoring habitat effectiveness within areas designated as winter range Land and Resource Management Plan for the Okanogan National Forest (Okanogan Forest Plan), (USDA FS 1989). Table 1 summarizes the road-associated factors that affect these species. An important issue addressed in this assessment is the access that roads provide on winter ranges for snowmobiling and other winter activities. Winter is an important time for ungulates as food resources are limited; energy reserves are at or below maintenance levels (McCorquodale 1991). This assessment was based on the assumption that the road density on winter ranges provides an index to the amount of winter human activity occurring. Should discrepancies exist between Forest Plan mapped winter range and actual winter range, this portion of the analysis will be conducted based on actual known winter range.

C5. Unique Habitats

Unique habitats include wetlands, talus slopes, caves, cliffs, snag patches, hardwood forests, meadows, etc., which provide important habitat for a wide variety of wildlife species. Unique habitats such as wetlands have special protection under the Okanogan Forest Plan (USDA FS 1989) and are managed by retaining buffers around them. Other unique habitats are managed on a site-specific basis through project design. Table 1 summarizes the road-associated factors that can affect unique habitats. An accurate, mapped information layer of the unique habitats in the Tonasket Sub-Basin was unavailable for this roads analysis. Ratings were based on the local knowledge of the resident biologists and an analysis using Utah State University LANDSAT Thematic Mapper 25 meter cover type data and local wetland data. Due to the necessary level of detail, a priority has been determined to map the unique habitats prior to the watershed level analysis.

Okanogan Sub-Basin

Bonaparte Creek Watershed

A. Human Use

A1. Public Use

Popular recreational activities in the Bonaparte assessment area include: camping, boating, fishing, hunting, swimming, hiking, horseback riding, ATV riding, firewood gathering, mountain bike riding, snowmobiling, cross country skiing, snowshoeing, trapping, viewing, and driving for pleasure. One of the main attractions to the area is Bonaparte Lake, which is part of an area called the Five Lakes Recreational Area. The Five Lakes Recreational Area includes developments in the Myers Creek and Toroda Creek Watersheds. There are four campgrounds

(Bonaparte Lake, Lost Lake, Beaver Lake, and Beth Lake campgrounds) within the Five Lakes Recreational Area. The Five Lakes Recreational Area receives one of the highest year-round recreational use levels on the Tonasket Ranger District. Conconully Recreational Area (Salmon Watershed) probably receives the next highest recreational use on the Tonasket Ranger District.

There are four developed hiking trails within the watershed: 4th of July Ridge, South Side, Pipsissewa, and Bonaparte Lake trails. There are dispersed camping sites scattered throughout the watershed, mostly along roads. Most use of these dispersed camp sites occurs during the fall hunting season. During the winter, Bonaparte Lake Campground becomes a sno-park which serves as an access point to a network of groomed and ungroomed snowmobile trails. There are no designated cross country ski trails in the area, although the snowmobile trails do receive cross country ski use. Currently there is no known conflict between these two user groups. The top of Mt. Bonaparte is a special interest point within the assessment area and is accessible by trail. This site offers panoramic views of the surrounding landscape. In addition, the remains of an old lookout cabin were entered on the National Register of Historic Places in 1980. A newer lookout tower is staffed during the summer months.

A2. Resource Management

Generally, the existing structural stage distribution for the Bonaparte assessment area is similar to other watersheds on the Tonasket Ranger District. Similarities include:

Late and old structure single storied (LOS-single) stands for all biophysical environments are below the historic range of variability (HRV). Generally, this is a result of past timber harvesting which focused on these types of stands causing a conversion to early and middle structure. In addition, the decrease in fire frequency has resulted in the conversion of single storied stands to multi storied stands.

Late and old structure multi-storied (LOS-multi) stands in the more cold and moist biophysical environments are above the HRV. Generally, this is a result of decreased frequency of stand replacement fires in these biophysical environments.

Middle structure stands for biophysical environments at the lower elevations are above the HRV. Generally, this is a result of past partial cutting, which focused in on the removal of large trees and areas of historically marginal forest growing into forested stands.

A unique aspect within the Bonaparte assessment area is that the frequency of late and old multi-storied stands are generally within or above the historic range of variability. Only warm-dry LOS-multi is below the historic range and only by one percent. This indicates there are greater opportunities in this watershed to manage the landscape within the historic range of variation for LOS than other watersheds.

Noxious weeds occur in all sub-watersheds within the Bonaparte assessment area. Species that occur within the Bonaparte assessment area include:

Knapweed (*Centuarea spp.*)
Sulfur cinquefoil (*Potentilla recta*)
Meadow hawkweed (*Hieracium pratense*)
St. John's wort (*Hypericum perforatum*)
Black henbane (*Hyoscyamus niger*)
Musk thistle (*Carduus nutans*)

Houndstongue (*Cynoglossum officinale*)

Information for this section was drawn from the Bonaparte Watershed assessment (USDA FS 1998b).

B. Aquatics

The Bonaparte Watershed is in the Okanogan Sub-Basin and is 102,120 acres. Of these acres, 32,292 (32%) acres are managed by the Forest Service; the remaining 69,828 (68%) acres are a combination of ownership that includes private owners (58%), Washington Department of Natural Resources (DNR) (9%), and Bureau of Land Management lands (1%).

Bonaparte Lake is the headwaters of Bonaparte Creek. Bonaparte Creek flows 27.1 miles from Bonaparte Lake to its confluence with the Okanogan River. The Forest Service manages 0.2 mile of Bonaparte Creek at the outflow of Bonaparte Lake. Bonaparte Creek then flows 26.9 miles from the boundary of Forest Service managed lands through private lands to its confluence with the Okanogan River at the town of Tonasket. The Forest Service also manages lands around Bonaparte Lake and the headwaters of tributaries to Bonaparte Creek.

Steelhead are known to use the confluence area of Bonaparte Creek with the Okanogan River to approximately river mile 1.0 of Bonaparte Creek, where there is a natural fish passage barrier falls. Bull trout are not known to use Bonaparte Creek. Rainbow trout and eastern brook trout were planted in Bonaparte Lake and Bonaparte and Peony Creeks. Before that time, salmonids were not known to have exploited the waters of Bonaparte Creek.

Sufficient depositional areas exist downstream of the Forest Service lands to filter fine sediment to an undetectable level before reaching the endangered summer steelhead habitat.

B1. Geologic hazard – Score 3

This factor helps characterize the primary erosion and sediment delivery processes in a watershed. Interpretation is based upon the subsection descriptions in "Landtype Associations of North Central Washington," a preliminary report (USDA FS 2000). Watersheds are rated based upon interpretations from the Landtype Association descriptive tables.

Fine sand and soil deposits are found in this watershed.

B2. Road-Related Fine Sediment – Score 3

Roads can be a significant source of fine sediment through erosion of the road surface, cut and fill slopes or causing accelerated mass soil movement.

The arterial and collector roads in the watershed are native surface. They are generally stable. Watershed is rated as at-risk for fine sediment, road system is a contributor to fine sediment but is not felt to be a major contributor and road system is generally consistent with Aquatic Conservation Strategy (ACS).

B3. Floodplain Function – Score 3

Roads can impact floodplain function by constricting stream channels, interrupting large woody

debris input and allowing vehicle access to the floodplain resulting in bank trampling, loss of riparian vegetation and bank erosion.

Some arterial and collector roads are located in the valley bottoms and are causing minor stream confinement. Dispersed recreation access is not resulting in adverse impacts to the floodplain and stream banks. Floodplain connectivity is rated as Functioning Appropriately; Riparian Habitat Conservation areas are rated as Functioning Appropriately or if rated as Functioning at Risk, the rating is not primarily due to dispersed recreation the along road system.

B4. Flow Effects –Score 3

Roads can intercept, concentrate, or divert flows causing increase in peak flows or changes in the timing of storm runoff.

On Forest Service lands the roads are located in a manner to avoid constriction of the channels but on private land Highway 20 is built on Bonaparte Creek and would be rated a 9. Road density and location are Functioning at Risk but change in peak/base flows is Functioning Appropriately

B5. At-Risk Fish Populations – Score 3

This factor addresses whether fish listed for protection under the Endangered Species Act are present in the watershed and the relative importance to recovery within the sub-basin.

Endangered summer steelhead spawn and rear in the Bonaparte Creek and in the Okanogan River downstream, but water quality is not altered due to road management on the Forest Service land. At risk fish are present with one or two significant sub-watersheds for a single species or in some cases multiple species but habitat and populations are fragmented or isolated within the watershed.

C. Wildlife

The Bonaparte Creek Watershed covers a moderately sized area (98,698 acres) of multiple use land. Road densities are high, and mixed ownership and human use may limit opportunities for improvement. The Chewiliken Creek Watershed covers an area of 81,772 acres adjacent to Bonaparte Creek Watershed. Human use is high throughout the year as the town of Tonasket is located here and a main highway bisects the watershed. There is potential for improvement within the watershed, although it may be limited by human use

C1. Wide-Ranging Carnivores

The open road density in the Bonaparte Creek Watershed is high, at 2.11 mi/mi^2. Approximately 22.4% of the watershed is core, for a total of 22,134 acres. The Chewiliken Creek Watershed has the lowest open road density within the Tonasket Sub-Basin, 0.81 mi/mi^2. Approximately 62% of the watershed is core habitat, for a total of 50,696 acres. All core habitat in these watersheds is located off of Forest Service land. Large portions of several LAUs fall within the Bonaparte Creek and Chewiliken Creek Watersheds. Table 2 describes the road density of those portions within these Watersheds. A description of each LAU in its entirety is available in the Appendix C.

Table 2. Road density of Lynx Analysis Units within the Bonaparte Creek and Chewiliken Creek Watersheds

LAU	Miles of open road	Area w/in watershed (mi^2)	Road density (mi/mi^2)
Bonaparte	30	16.6	1.8
Maple	19.6	5.1	3.9
Tunk (Bonaparte)	11.4	4.4	2.6
Tunk (Chewiliken)	4.5	2.3	2.0

Mean Road Density = 2.6 mi/mi^2

C2. Late-Successional Associated Wildlife Species

The Tonasket Sub-Basin does not manage for the Late Successional Reserve Land Allocation.

C3. Riparian Dependent Wildlife Species

Riparian reserves are limited and occupy only approximately 767 acres (0.8%) of the Bonaparte Creek Watershed and 46 acres (0.1%) of the Chewiliken Creek Watershed. The open road density within the riparian reserves is moderate within Bonaparte Creek Watershed, at 1.8 mi/mi^2, and high within the Chewiliken Creek Watershed, at 2.8 mi/mi^2.

C4. Ungulates

The Bonaparte Creek Watershed contains a large amount of mapped ungulate winter range, 12,223 acres (12.4%). The road density within winter range is high, 2.1 mi/mi^2. The Chewiliken Creek Watershed contains the smallest amount of mapped winter range within the Tonasket Sub-Basin. There are only 32 acres (<1%) of winter range with an open road density of 0 mi/mi^2.

C5. Unique Habitats

Cliffs and talus slopes occur on the south side of Cayuse Mountain. Cliffs are present on the east side of Island Mountain, west of Bonaparte Lake, and on the west side of Bannon Mountain in the Bonaparte Creek Watershed. Bonaparte Lake provides habitat for common loons.

Antoine-Siwash Watersheds

A. Human Use

A1. Public Use

The key recreation activities in the watershed includes cross country skiing, snowmobiling, motorized driving for pleasure, horseback riding, forest product gathering, hiking, ATV-ORV riding, mountain biking, camping, snowshoeing, hunting, and trapping. The watershed provides Roaded Modified, Roaded Natural, and Semi-Primitive Motorized recreation opportunities. There are four developed recreational sites (Highlands Sno-park, Mount Bonaparte Lookout, Antoine Trailhead, Fourth of July Ridge Trailhead) within the watershed.

There are three developed trails in the watershed: Antoine #304, Fourth of July Ridge #307, and Cabin #303.

Dispersed campsites are located throughout the watershed. Most of the use at these dispersed sites occurs in the summer and fall. These sites usually consist of a flat area where a vehicle and tents can be placed. Structures for hanging game and rock fire rings are common at these sites. Many users often return to the same dispersed site year after year.

Four hundred and twenty-nine cow/calf pairs are grazed annually within the watershed. The assessment area contains 14,559 acres of National Forest land suitable for livestock grazing. All of these acres are primary range and are actively grazed at some point during the grazing season. About 1,575 acres of transitory range exists in the assessment area from logging in the past ten years. The Redmill timber sale will make an additional 556 acres of transitory range. This range will be effective for about 20 years, until tree crowns grow together shading out the grasses.

A2. Resource Management

The Antoine-Siwash assessment area has been delineated into eight biophysical environments: non-forest, hot-dry, warm-dry, cool-dry, cool-mesic, cold-dry, cold-mesic, and very moist. The fire history (1940 through 1997) within the Antoine-Siwash Watersheds was determined using District and Forest fire records and historical fire maps. The records are for only Forest Service lands or 26% (20,619 acres) of the assessment area. The potential for fire is approximately 1.4 fires per year or 14 per decade. Because of the unknown fire occurrence on state and private lands, the total fire potential for the entire watersheds is unknown. District fire records show that 80 fires have occurred within the watersheds in the last 57 years. There have been 69 (86%) lightning fires; 11 (14%) human-caused fires have occurred in the watersheds area during the last 57 years.

Risk of fire may increase in this watersheds area over the next few decades due to increased human activities, including recreation and development, and increased fuel loadings resulting from timber stand collapse brought about by insect infestations and stand stagnation. In addition to the increased fire hazard, fire control efforts would be hampered by high-level dead and downed material, causing delayed firefighter access and contributing to conditions where intense burning can occur. These conditions increase risk of entrapment and injury to firefighters and the public.

Noxious weed surveys have been completed in the watershed. Most of the weed populations were identified prior to 1997 and the sites were analyzed under the Okanogan National Forest Integrated Weed Management Environmental Assessment (USDA FS 1998a). Approximately 344 affected acres of noxious weeds were identified in 1997. Affected acres are those acres surrounding and including existing weed populations that contain seed banks or are readily available for weed introduction. The species, locations, approximate acres, and Okanogan County and Forest Service classifications are listed in Tables 3 and 4, followed by a definition of each classification.

Table 3. Known noxious weeds within the assessment area

Species	Acres	Okanogan County classification	Forest Service classification
Diffuse and Spotted knapweed	15.0	C and B-Designate	New invader
St. John's wort	3.0	C	New invader
Sulfur cinquefoil	2.0	B-Designate	New invader
Common houndstongue	2.0	C	New invader
Meadow hawkweed	12.0	B-Designate	New invader
Orange hawkweed	6.0	B-Designate	New invader
Musk thistle	20.0	B-Designate	New invader
Absinth wormwood	25.0	Not listed	Established invader
Canada thistle	5.0	C	Established invader
Bull thistle	5.0	C	Established invader
Total	90.0		

Table 4. Locations of noxious weed sites within the assessment area

Location	Acres	Species
Road 3300350	5.0	Orange hawkweed and musk thistle
Roads 3250150 and 260	15.0	Orange & meadow hawkweed, diffuse and spotted knapweed, Canada and bull thistle
Road 3230070, 080, 090	45.0	Diffuse and spotted knapweed, meadow hawkweed, absinth wormwood, Canada and bull thistle
Road 3235	20.0	Diffuse and spotted knapweed, musk thistle, Canada and bull thistle
Road 3525	3.0	Diffuse thistle
County Road 4629	2.0	Musk thistle
Total	90.0	

Class B-Designate and new invader weed species are those not native to the state or county, which are of limited distribution or are unrecorded in the region, that pose a serious threat to the region, and whose populations are such that all seed production can be prevented within a calendar year.

Class C weed, Established Invader species are all other noxious weeds.

Information for this section was drawn from the Antione-Siwash Watershed assessment (USDA FS 1997a).

B. Aquatics

Managerially, the Okanogan National Forest has placed the Antoine Watershed into a watershed group unit called Northeast (NE) Okanogan River. The latest change is that the Antoine-Siwash "watersheds" are lumped together a single watershed, together with Tonasket Creek Watershed.

The Antoine Watershed is 46,695 acres. Of these acres, 9,968 (21%) are managed by the Forest Service, the remaining 36,727 (79%) acres are a combination of ownership that includes private owners (72%), Washington Department of Natural Resources (6%), and Bureau of Land Management managed lands (<1%).

The Siwash Watershed is 30,946 acres. Of these acres, 10,567 (34%) are managed by the USFS, the remaining 20,379 (66%) acres are a combination of ownership that includes private owners (60%), Washington Department of Natural Resources (5.5%), and Bureau of Land Management managed lands (<1%).

Antoine and Siwash Creeks are in the heart of the Okanogan Highlands, an agriculturally productive area. This land and a majority of the Antoine and Siwash Creeks Valley are privately owned. Much of it has been planted to grass for hay.

Antoine Creek has Fancher Dam at approximately river mile 10. Much of the Forest Service lands are upstream of this dam. The streams that drain lands managed by the Forest Service that enter Antoine Creek below Fancher Dam are intermittent headwaters of tributaries to Antoine Creek and Whiskey Cache Creek.

Antoine Creek enters the Okanogan River approximately four miles north of the city of Tonasket, Washington. Steelhead are known to use the Okanogan River and Antoine Creek confluence area (Hinkley 1998). Steelhead are not known to use Antoine Creek or Whiskey Cache Creek (a tributary to Antoine Creek). Eastern brook trout have been caught in Antoine Creek below Fancher Dam, but are not stocked there. Eastern brook trout have been stocked in the reservoir behind Fancher Dam and are located on National Forest.

Siwash Creek enters the Okanogan River approximately at the north end of the city of Tonasket, Washington. There is a functioning deposition area between the Forest Service lands and the confluence with the Okanogan River. Steelhead are known to use the mainstem Okanogan River and may use the Siwash Creek confluence area (Hinkley 1998).

Bull trout are not known to use or have used either Antoine Creek or Siwash Creek.

B1. Geologic hazard –Score 3

Fine sand and soil deposits are found in this watershed.

B2. Road-Related Fine Sediment – Score 3

The arterial and collector roads in the Antoine and Siwash Sub-Watersheds are native surface. They are generally stable as the land is gently rolling. Watershed is rated as at-risk for fine sediment, road system is a contributor to fine sediment but is not felt to be a major contributor and road system is generally consistent with ACS.

B3. Floodplain Function – Score 3

Some arterial and collector roads are located in the valley bottoms and are causing minor stream confinement. Dispersed recreation access is not resulting in adverse impacts to the floodplain and stream banks. Floodplain connectivity is rated as Functioning Appropriately; Riparian Habitat Conservation areas are rated as Functioning Appropriately or if rated as Functioning at Risk, the rating is not primarily due to dispersed recreation along the road system.

B4. Flow Effects – Score 3

Road density and location are Functioning at Risk but change in peak/base flows is Functioning Appropriately.

B5. At-Risk Fish Populations – Score 3

Endangered summer steelhead spawn and rear in the mouth of Antoine Creek, Siwash Creek, and the Okanogan River downstream of this watershed, but water quality is not likely altered due to the presence of roads on the Forest Service land. "At risk" fish are present with one or two significant sub-watersheds for a single species or in some cases multiple species but habitat and populations are fragmented or isolated within the watershed.

C-1. Wildlife: Antoine Creek and Upper Mainstem Okanogan River Watersheds

The Antoine Creek Watershed covers a small area (46,695 acres). The watershed road density is high and this watershed experiences extremely heavy human use. The Upper Mainstem Okanogan River Watershed is a small watershed (83,877 acres) adjacent to the Antoine Creek Watershed. These watersheds consist of mixed ownership land with extremely high human use, thereby limiting improvement potential. (In this discussion, numbers presented in (%) are a percentage of the corresponding watershed acreage.)

C1a. Wide-Ranging Carnivores

The open road density in the Antoine Creek Watershed is high at 2.20 mi/mi^2. Approximately 23.9% of the watershed is core habitat, for a total of 11,170 acres. Core habitat is limited in the Upper Mainstem Okanogan River Watershed. Approximately 39.4% of the watershed is core habitat, for a total of 33,030 acres. All core habitat in these watersheds is located off of Forest Service land. The current open road density is high as well at 2.39 mi/mi^2. A 12.8mi^2 portion of the Bonaparte Lynx Analysis Unit (LAU) is located within the Antoine Watershed. This portion has a high open road density of 2.1 mi/mi^2. For a description of each LAU in its entirety, see Appendix C.

C1b. Late-Successional Associated Wildlife Species

The Tonasket Sub-Basin does not manage for the Late Successional Reserve Land Allocation.

C1c. Riparian Dependent Wildlife Species

Riparian reserves occupy only approximately 287 acres (0.6%) of the Antoine Creek Watershed and have a moderate open road density of 1.3 mi/mi^2. Riparian reserves occupy only 434 acres (0.5%) of the Upper Mainstem Okanogan River Watershed and have a moderate open road density of 1.0 mi/mi^2.

C1d. Ungulates

The Antoine Creek Watershed provides a moderate amount of mapped ungulate winter range of 4,063 acres (8.7%). The road density within this winter range is high, 2.3 mi/mi^2. The Upper Mainstem Okanogan River Watershed also provides a moderate amount of ungulate winter range, 3,678 (4.4%) acres, with a very low open road density of 0.1 mi/mi^2.

C1e. Unique Habitats

Cliffs, small aspen groves, and scattered ponds are present on the west side of Mount Hull in the Mainstem Okanogan River Watershed. Some of the best cliff habitat on the Tonasket Sub-Basin occurs in this area. Summit Lake, next to Road 3525, provides various life requisite needs for a broad array of species. Cliffs occur near Burge Mountain in the Antoine Creek Watershed. [Remaining snag patches in most watersheds are located in areas away from roaded access.]

C-2. Wildlife: Siwash Creek Watershed

The Siwash Creek Watershed covers a small area (31,343 acres) adjacent to the town of Tonasket. The watershed road density is moderate, with roads accessing multiple-use lands. The watershed experiences extremely heavy human use, which may limit opportunities for improvement.

C2a. Wide-Ranging Carnivores

The open road density in the Siwash Creek Watershed is moderate at 1.63 mi/mi^2. Approximately 26.1% of the watershed is core habitat, for a total of 8,177 acres. All core habitat is located off of Forest Service land. A 10.8 mi^2 portion of the Bonaparte Lynx Analysis Unit is located within the Siwash Creek Watershed. This area has a moderate open road density of 1.9mi/mi^2. For a description of each LAU in its entirety, see Appendix C.

C2b. Late-Successional Associated Wildlife Species

The Tonasket Sub-Basin does not manage for the Late Successional Reserve Land Allocation.

C2c. Riparian Dependent Wildlife Species

Riparian reserves occupy only approximately 725 acres (2.3 %) of the Siwash Creek Watershed and have a moderate open road density of 1.3 mi/mi^2.

C2d. Ungulates

A large portion of the Siwash Creek Watershed is mapped ungulate winter range, 5,452 acres (17.4%). The road density within this winter range is moderate, 1.8 mi/mi^2.

C2d. Unique Habitats

Scattered small patches of aspen are present in the northern portion of the watershed. Approximately 70% of the land classified as deciduous in the watershed occurs on Forest Service lands. Some cliffs are present near Burge Mountain. Wetland habitat is present at Harbor Lake, southwest of Burge Mountain.

Salmon Creek Watershed

A. Human Use

A1. Public Use

The Salmon Watershed provides year-round recreation opportunities. The Forest Service is currently managing the watershed for three recreation opportunity spectrums (ROS): semi-primitive non-motorized, roaded natural, and roaded modified. The watershed provides opportunities for camping, boating, fishing, hiking, horseback riding, driving for pleasure, hunting, firewood gathering, and snowmobiling. There are approximately 40 miles of groomed snowmobile trails that take riders through the watershed. Snowmobiling, hunting, camping, and fishing play a major role in the Conconully economy.

In addition to the snowmobile trails, there are approximately 40 miles of summer use trails within the watershed. They get about 60% foot travel and 40% horseback use. Trail use by snowmobilers, horseback riders, and hikers has increased. However, with declining budgets for maintenance, condition of trails have declined to poor to fair condition, needing heavy tread work, erosion control, and ditch work.

There are currently five developed campsites within the watershed. Sugarloaf, Cottonwood, Oriole, Kerr, and Salmon Meadows, which are all managed by the Forest Service (see Figure 3-4). In addition, several dispersed sites fall within the watershed: Kootenai, Wagon Camp, as well as numerous hunter camps. These dispersed sites are particularly popular during the fall hunting seasons. Current use of the developed campsites within the watershed is not exceeding the capacity.

Currently on national forest, there are 9 active grazing allotments within the watershed with 1405 cow/calf pairs. Although each allotment may have different grazing seasons an average grazing season is from June 21st to September 30th.

A2. Resource Management

Currently, of the lands administered by the Forest Service within the Salmon watershed, about 87% is managed on a scheduled timber harvest basis. This accounts for about 16% of all the lands under scheduled harvest on the Tonasket Ranger District.

The Salmon watershed was delineated into seven biophysical environments: 1) open or non-forest, 2) hot, dry ponderosa pine/Douglas fir, 3) warm, dry Douglas-fir, 4) cool, mesic Douglas fir, 5) cool, wet subalpine fir, 6) cold, dry subalpine fir and 7) cold, mesic subalpine fir.

Table 5. Biophysical environments totals for all sub-watersheds

	Biophysical environments (acres)					
Structure	Hot-Dry	Warm-Dry	Cool-Mesic	Cool-Wet	Cold-Dry	Cold-Mesic
Early	560 (17%)	6940 (28%)	2437 (14%)	912 (8%)	32 (3%)	598 (9%)
Middle	2632 (79%)	11677 (47%)	8974 (53%)	5524 (49%)	735 (65%)	4302 (68%)
Late/Old	119 (4%)	6324 (25%)	5568 (33%)	4840 (43%)	358 (32%)	1404 (22%)

The Salmon Creek watershed is outside of the historical range of variability in the following biophysical environment/structural stage combinations:

Deficient in Early structure in Cool Wet (-7%), Cold Dry (-14%), and Cold Mesic (-18%).
Deficient in Late/Old structure in Hot Dry (-26%) and Warm Dry (-4%).
Surplus in Early structure in Hot Dry (+16%), Warm Dry (+24%), and Cool Mesic (+4%).
Surplus in Middle structure in Hot Dry (+8%) and Cold Dry (+4%).
Surplus in Late/Old structure in Cool Wet (+20%) and Cold Mesic (+10%)

All other combinations are within the historic range of variability.

The information in this section was drawn from the Salmon Creek Watershed analysis (USDA FS 1997b).

B. Aquatics: North Fork, West Fork and South Fork Salmon Sub-Watersheds

The Salmon Creek Watershed is 105,357 acres. Of this, 57,911 acres are managed by the Forest Service (55%). Of the remaining 47,446 acres, 24% are privately owned, the Washington State Department of Natural Resources (DNR) manages 14%, and the Bureau of Land Management (BLM) manages 7%.

The Forest Service managed lands in the North Fork Salmon Sub-Watershed drain to Conconully Reservoir. Some of the water is diverted to Conconully Lake, which is impounded by Salmon Lake Dam (at approximately river mile 17). The Forest Service-managed lands in the West Fork Salmon and South Fork Salmon Sub-Watersheds also drain to Conconully Reservoir. Conconully Dam is located at approximately river mile 16. The mainstem of Salmon Creek begins below Conconully Lake/Dam. At approximately four miles upstream of the confluence of the mainstem Salmon Creek and the Okanogan River, there is an irrigation diversion dam that was a barrier to fish passage until the construction of a fish ladder bypassing the dam was constructed in 1999. The mainstem Salmon Creek below the irrigation diversion dam becomes totally dewatered during the "irrigation season" from April to September or October. The Colville Confederated Tribes and the Okanogan Irrigation District are working on plan to provide flow year-round in the creek

Historical data indicates that bull trout once exploited the waters of the Salmon Creek watershed. Extensive surveys using an electro-shocker in 1992, 1994 and 1995 and snorkel surveys in 2001 failed to locate any bull trout, Eastern brook trout (a non-indigenous species native to the eastern US) were planted throughout the watershed beginning in the 1920s. Dams were constructed at Conconully Lake (Salmon Lake Dam) and at Conconully Reservoir (Conconully Dam) in the early 1900s.

Within the Salmon watershed isolated populations of rainbow/redband trout are present. It is likely that no gene flow has occurred naturally to these areas from the stocked lakes and streams

downstream. It is possible that genetically these fish may be significant. No genetic work has been done on the redband/rainbow populations in Salmon Watershed. North Fork Salmon Creek was stocked above natural upstream migration barrier falls with what appear to be westslope cutthroat trout. These populations are considered significant and will be used to prioritize projects on the District.

B1. Geologic hazard – Score 6

3 = moderate hazard (overall)
6 = high hazard (Funk Mtn., South Fork Salmon, North Fork Salmon)

B2. Road-Related Fine Sediment –Score 6

Road 4200 slump on South Fork Salmon Creek, roads 38200 and 3800 on the North Fork Salmon Creek, and road 3730 on a tributary to the West Fork Salmon Creek have added and will continue to add fine sediment. Overall the road system appears to be adding a lot of sediment. This condition is not at an "Unacceptable" condition and is rated a 6. Watershed is rated as At Risk for fine sediment, roads are felt to be a major source of fine sediment and road system is inconsistent with ACS.

B3. Floodplain Function – Score 6

This condition is most notable on the North Fork Salmon Creek, where the floodplain is narrow and much of it needs to be used for the road. Dispersed recreation is increasing here even though several campgrounds are provided. This is not the case with the West Fork of Salmon Creek. South Fork Salmon Creek confines the stream at the crossings, and dispersed recreation tends to concentrate there as well, but the affects are moderate. There is a wide range of dispersed recreation in the watershed in the riparian so this rating is made with the North Fork Salmon in mind because that is the habitat most likely to be used if summer steelhead were reintroduced above the Conconully Reservoir Dam. Main arterial and/or collectors are constricting streams so that floodplain connectivity is rated At Risk and/Riparian Conservation Areas are rated as At Risk due to dispersed recreation; or if there is concern over potential dispersed use even if Riparian Conservation Areas are currently Functioning Appropriately. Dispersed use is not consistent with Aquatic Conservation Strategy (ACS) or appears to be moving towards being inconsistent with ACS.

B4. Flow Effects - Score 6

Increases of peak flows are likely. Large cut slopes were needed to build some of the roads in this watershed. Portions of the 3800 and 3730 roads could be considered intermittent stream by definition. Road density, actual roads, has been reduced recently but many of the "closed" roads have open ditches and peak and base flows are likely altered to a discernable degree. Road density and location are Functioning at Risk or Unacceptable Risk and change in peak/base flows is Functioning at Risk

B5. At-Risk Fish Populations – Score 3

A proposal to reintroduce summer steelhead to the upper Salmon Watershed would put at-risk fish back into the watershed on the Tonasket Ranger District. At present several populations of suspected redband trout and a population of suspected westslope cutthroat trout reside on the Forest Service lands. At this time the population range and purity is not known; however, all the

sub-watersheds meet in Conconully Reservoir and stocking with various strains of rainbow trout has occurred here for over 50 years. It is likely that there is no connection of populations suspected in North Fork Salmon Creek with that of the population suspected in West Fork Salmon Creek. At-risk fish are present with one or two significant sub-watersheds for a single species or in some cases multiple species but habitat and populations are fragmented or isolated within the watershed.

C. Wildlife

The Salmon Creek Watershed is located on the northwest side of the Sub-basin and is moderately sized (105,361 acres). This watershed provides some of the highest quality habitat within the Sub-Basin. This watershed experiences high human use and accesses heavily-used recreational areas.

C1. Wide-Ranging Carnivores

Core habitat is moderately abundant in the Salmon Creek Watershed. The current open road density is moderate at 1.57 mi/mi2. Approximately 41.2% of the watershed is core habitat, for a total of 43,368 acres. However, only 21,712 acres (20.6%) of the core habitat are located on US Forest Service land. Portions of three Lynx Analysis Units (LAUs) are located within the Salmon Creek Watershed (with areas >0.1 sq. mile). The following table describes the road density of those portions within the Salmon Creek Watershed. There have been numerous lynx sightings within this watershed. For a description of each LAU in its entirety, see Appendix C.

Table 6. Road density of portions of Lynx Analysis Units within the Salmon Creek Watershed

LAU	Miles open road	Area w/in watershed (mi^2)	Road density (mi/mi^2)
Cecile Creek	0	0.5	0
North Fork Salmon Creek	53.6	36.0	1.5
West Fork Salmon Creek	56.8	43.0	1.3

Mean Road Density = 0.9 mi/mi^2

C2. Late-Successional Associated Wildlife Species

The Tonasket Sub-Basin does not manage for the Late Successional Reserve Land Allocation.

C3. Riparian Dependent Wildlife Species

Riparian reserves occupy only approximately 4,823 acres (4.6%) of the Salmon Creek Watershed and have a very high open road density of 3.2 mi/mi^2.

C4. Ungulates

The Salmon Creek Watershed provides a small amount of ungulate winter range, 1,769 (1.7% acres, with a moderate open road density of 1.3 mi/mi^2.

C5. Unique Habitats

A little over half the area classified as deciduous in this watershed occurs on Forest Service lands. Large and small aspen stands are present near the northeastern boundary near the

Similkameen River and Tunk Creek Watersheds. Scattered small cottonwood and aspen stands are present along tributaries of the West Fork Salmon Creek. Cliffs and talus slopes are present on the peaks along the northwestern edge of the watershed and near Schalow Mountain. Avalanche chutes and talus slopes descend east near the crest of the watershed bordering Middle Methow and Lower Chewuch River Watersheds. Road 3700000 goes near or crosses some of these. Salmon Meadows is located at the end of Road 3800000.

Northeast Okanogan (Tonasket) Watershed

A. Human Use

The existing conditions for this watershed are included in the Antoine Siwash Watershed existing conditions section of this document.

B. Aquatics

Managerially, the Okanogan National Forest has placed the Tonasket Watershed into a watershed group unit called the Northeast Okanogan River, the latest change is the Antoine-Siwash "watershed" has been split, leaving Tonasket Creek and some intermittent streams that flow directly to the Okanogan River.

The Tonasket Watershed is 35,463 acres. Of these acres, 8,815 (25%) acres are managed by the Forest Service; the remaining 26,648 (75%) acres are a combination of ownership that includes private owners and Washington Department of Natural Resources managed lands.

Tonasket Creek enters the Okanogan River east of the city of Oroville, Washington. Steelhead are known to use the Okanogan River and Tonasket Creek from River Mile 0 to approximately River Mile 1.7. Steelhead have been seen spawning and rearing in Tonasket Creek in the vicinity of the confluence with the Okanogan and in the alluvial fan of Tonasket Creek.

Tonasket Creek is in the heart of the Okanogan Highlands, an agriculturally productive area. The higher elevations of this watershed are privately owned, and much of it has been planted, mostly to grass for hay.

Five channels drain the West Mount Hull drainage area. Mosquito Creek is perennial. Whistler Canyon is often perennial, but in years of low precipitation is known to be intermittent or dry. The other three channels are intermittent and flow during snow melt-off only. None of the channels is fish-bearing on Forest Service managed lands.

Presently, road management of Forest Service lands has the potential to alter water quality to a notable degree in Tonasket Creek and Whistler Canyon Creek, because no functioning depositional areas exist between Forest Service lands and the population of endangered summer steelhead in the Okanogan River.

A defunct collector road, the 3525-100 road, crosses the face of Mount Hull and affects the water quality of Whistler Canyon Creek on Forest Service lands, even more so on land managed by the Bureau of Land Management (BLM). It was reopened to suppress the Rocky Hull Fire of 2000.

(The 3525-100 road is now closed to passenger vehicle travel, except for administrative use, the road can be used by off-road vehicles, horseback riders, bicyclists, and pedestrians).

The arterial and collector roads in the Tonasket Sub-Watershed are native surface. They are generally stable because the land is gently rolling above the rock bluffs visible from Highway 97. But the proximity, lack of effective water bars, and culvert design/size of the associated roads contribute to degrading water quality in this sub-watershed.

Tonasket Creek, Reach 2 on Forest Service managed lands, begins where Tonasket Creek crosses the Forest Service boundary in Haley Canyon. Reach 2 begins at approximately River Mile 13. Tonasket Creek is a first-order stream on Forest Service lands. Intermittent streams draining the portions that the Forest Service manages on the north side of Mount Hull flow to Tonasket Creek. These streams have the potential to alter water quality in Tonasket Creek.

The Aquatic portion of the roads analysis at the sub-basin scale characterizes how the transportation system may be influencing watershed processes and aquatic habitat. The basic units of analysis are the watersheds within the sub-basin. The sub-basin scale analysis will help prioritize watersheds for further analysis based upon aquatic resources and potential restoration needs, identify issues within watersheds and establish context for the watershed scale analysis. Road segments are the major arterials and collector roads.

B1. Geologic hazard – Score 3

Fine sand and soil deposits are found in this watershed.

B2. Road-Related Fine Sediment – Score 3

The arterial and collector roads in the Tonasket Sub-Watershed are native surface. They are generally stable as the land is gently rolling above the rock bluffs visible from Highway 20. But the proximity, lack of effective water bars, and culvert design/size of the associated roads contribute to degrading water quality in this sub-watershed. The arterials would be rated a 3 on Forest Service lands. Storm runoff in the area is common and private/county roads rate a 9. The watershed is rated as At Risk for fine sediment; the road system is a contributor to fine sediment but is not felt to be a major contributor and road system is generally consistent with ACS.

B3. Floodplain Function – Score 3

Some arterial and collector roads are located in the valley bottoms and are causing minor stream confinement. Dispersed recreation access is not resulting in adverse impacts to the floodplain and stream banks. Floodplain connectivity is rated as Functioning Appropriately; Riparian Habitat Conservation areas are rated as Functioning Appropriately or if rated as Functioning At Risk, the rating is not primarily due to dispersed recreation along the road system.

B4. Flow Effects – Score 3

The proximity, lack of effective water bars, and culvert design/size of the associated roads contribute to degrading water quality in this sub-watershed.

Road density and location are Functioning At Risk but change in peak/base flows is Functioning Appropriately.

B5. At-Risk Fish Populations – Score 3

Endangered summer steelhead spawn and rear in the mouth of Tonasket Creek and Okanogan River downstream of this watershed. At-risk fish are present, with one or two significant sub-watersheds for a single species or in some cases multiple species but habitat and populations are fragmented or isolated within the watershed.

C. Wildlife

The Tonasket Creek Watershed is located on the northern end of the Tonasket Sub-Basin. This watershed covers a small area (57,818 acres) of multiple use land next to the Canadian Border. Road densities are high, and mixed ownership and human use limit opportunities for improvement.

C1. Wide-Ranging Carnivores

The open road density in the Tonasket Creek Watershed is high, at 3.0 mi/mi^2. The Tonasket Creek Watershed has the lowest amount of core habitat in the Tonasket Sub-basin. Only 17.9% of the watershed is core, for a total of 10,341 acres. All core habitat is located off of Forest Service land. No Lynx Analysis Units (LAUs) are located within the Tonasket Creek Watershed.

C2. Late-Successional Associated Wildlife Species

The Tonasket Sub-Basin does not manage for the Late Successional Reserve Land Allocation.

C3. Riparian Dependent Wildlife Species

Riparian reserves occupy only approximately 291 acres (0.5%) of the Tonasket Creek Watershed but have a very high open road density of 3.5 mi/mi^2.

C4. Ungulates

The Tonasket Creek Watershed contains a moderate amount of mapped ungulate winter range, 3,070 acres (5.3%). The road density within winter range is high, 3.3 mi/mi^2.

C5. Unique Habitats

Wetland habitat is present at Meadow Lake, along Haley Canyon, and scattered along the northern portions of the Forest Service lands.

Southeast Okanogan (Fish Coulee, Tunk, Chewiliken) Watershed

A. Human Use

A1. Public Use

This watershed is mostly private property. It includes the two very small communities Synarep (Tunk Creek) and Talkire Lake (Chewiliken Creek). Only a very small portion of the Tonasket District lies within the southeast Okanogan Watershed. The portion of the Forest that is in this watershed lies adjacent to Crawfish Lake and Tunk Mountain.

Crawfish Lake is a non-fee site popular with campers, hunters and fishermen. There is a snow-park located nearby, so the area sees use by snowmobilers also. A number of summer cabins are

located around the perimeter of the lake on private lands, and some cross-country skiing occurs nearby.

Tunk Mountain has no recreation sites, but it does have a substantial complex of communication facilities. There are both government-owned and private, permitted facilities at this site. There is also a fire lookout at the top of Tunk Mountain that affords a fine view of the area. The Tunk Mountain Lookout is only staffed during periods of very high fire danger or active incidents in the vicinity.

To summarize, the key recreation activities in the watershed includes cross country skiing, snowmobiling, motorized driving for pleasure, horseback riding, forest product gathering, camping, and hunting. The watershed provides Roaded Modified and Roaded Natural recreation opportunities. Crawfish Lake, accessed by Forest Road 30, is the only developed recreational site within the watershed.

There are no developed trails within the watershed. Dispersed camping sites are not common in the southeast Okanogan watershed, since the vast majority of it is located on private lands.

A2. Resource Management

The biophysical environment and fire return interval for the watershed are summarized in the table below.

Table 7. Watershed biophysical environment and fire return interval

Biophysical environment	Fire ecology group	Percent of watershed	Fire return interval (in years)
Open	0	59%	7-10
Hot-dry	1	7%	7-10
Warm-dry	3	3%	10-24
Cool-dry	4	17%	10-40
Cool-mesic	5	3%	40-100
Cold-dry	7	7%	100-150
Cold-mesic	7	3%	100-150
Very moist	8	1%	150+

Insect infestations, dwarf mistletoe infections, windthrow and fire are the major vegetation altering disturbances within the Southeast Okanogan Watershed area. The fire scars and fire affects on the landscape are obvious. Evidence in the form of fire scars on residual trees, charred woody material, vegetative species composition, age and structure indicate that both low intensity surface fires and higher intensity stand replacing fires have occurred on these sites.

No future timber sales have been identified on National Forest that would affect this area.

Noxious weeds have been located in most areas where ground disturbance has occurred. Within the watershed, private lands have small, scattered populations of noxious weeds, particularly diffuse knapweed. Canada thistle (*Cirsium arvense*) is widespread throughout the watershed where logging activities and land development have caused disturbance. Infestations of diffuse

knapweed (*Centaurea diffusa*) occur primarily in and along road right of ways, gravel pits and hay ground. Spread is occurring along these areas and into undisturbed sites. Some of these patches have grown to several acres in size. New infestations of meadow hawkweed (*Hieracium aurantiacum*) and oxeye daisy (*Chrysanthemum leucanthemum*) have been discovered north of Crawfish Lake. Sulfur cinquefoil (*Potentilla recta*) is present in many areas and is thought to be widespread. Other noxious weeds of concern that occur include Dalmatian toadflax (*Linaria dalmatica ssp. dalmatica*), Common St. John's wort (*Hypericum perforatum*), Scotch thistle (*Onopordum acanthium*) and common tansy (*Tanacetum vulgare*).

A portion of one grazing allotment lies within this watershed, the Tunk Allotment. A total of four hundred cow/calf pairs are grazed annually, but only a very small portion of the watershed lies within National Forest and the Allotment, about 3,000 acres. That area is primary range and is actively grazed at some point during the grazing season. Some livestock grazing likely occurs on private lands adjacent to the Forest also.

B. Aquatics

The Fish Coulee drainage area is a closed basin situated within the Mainstem Okanogan watershed. The drainage area includes Fish Coulee Creek/Marsh, Fish Lake, Gibson Creek and Spikeman Creek. The Fish Coulee drainage area has no overland flow to the Okanogan River or to any other streams. Water that drains to the Fish Coulee drainage area remains there.

There are no fish bearing streams in the Tunk Sub-Watershed or Chewiliken Sub-Watershed on Forest Service lands. Chewiliken Creek is a first-order stream on the Forest Service lands. Only one intermittent stream leaves the Forest Service lands for Tunk Creek. This stream exits the Forest Service from Beehive Mountain and meanders on the broad flat bench above Tunk Creek and disperses into agricultural fields before the confluence with Tunk Creek.

Chewiliken Creek is paralleled by an arterial Forest Service road, but just downstream on state and private land a series of wetlands filters any mistakes made in road design.

Sediment additions to the endangered summer steelhead in the Okanogan River occurring from the maintenance of existing roads in this watershed would not be detectable.

B1. Geologic hazard – Score 0

Fine sand and soil deposits are found in this watershed but are of no concern.

B2. Road-Related Fine Sediment – Score 1

Watershed is rated as Functioning Appropriately for fine sediment, transportation system consistent with the ACS.

B3. Floodplain Function – Score 1

Main arterials and collectors are not located in valley bottoms or if located in valley bottom are neither constricting the channels nor providing dispersed recreation access which is diminishing floodplain function. Floodplain connectivity and Riparian Reserves are rated as Functioning Appropriately.

B4. Flow Effects – Score 1

Roads are not greatly impacting watershed function. Road density and location, change in peak/base flows are Functioning Appropriately.

B5. At-Risk Fish Populations

At-risk fish are present but there are no significant sub-watersheds.

Table 8 summarizes of the aquatic rating for all the watersheds with the Okanogan Sub-Basin.

Table 8. Summary of sub-basin indicators

Sub-basin	Watershed	Geologic hazard	Rd-related fine sed.	Flood-plain funct.	Flow effects	At-risk fish	Total rating
Okanogan	Salmon	6	6	6	6	3	27
Okanogan	NE Okanogan	3	3	3	3	3	15
Okanogan	Bonaparte	3	3	3	3	3	15
Okanogan	Antoine/Siwash	3	3	3	3	3	15
Okanogan	SE Antoine	0	1	1	1	1	4
Okanogan	SW Antoine (rated excluding Highway 20 conditions)	3	3	3	1	1	11

C-1. Wildlife: Tunk Creek Watershed

The Tunk Creek Watershed is the second largest watershed (191,530 acres) in the Tonasket Sub-Basin. This watershed is centrally located and includes very little federal land. Human use is high; motorized activity tends to be concentrated along a parallel road system that bisects the watershed. There are several opportunities for improvement within this watershed, especially with regard to deer fawning.

C1a. Wide-Ranging Carnivores

The open road density within the Tunk Creek Watershed is moderate at 1.02 mi/mi^2. Approximately 55.5% of the watershed is core habitat, for a total of 106,246 acres. However, only 1,357 acres (1%) of core habitat are located on Forest Service land. A portion of the North Fork Salmon Creek LAU is located within the Tunk Creek Watershed. The North Fork Salmon Creek LAU contains 4.9 miles of open road in an area of 2.2 mi^2, for a high open road density of 2.2 mi/mi^2. A small 3.4 mi^2 portion of the Tunk LAU is also located within the Tunk Creek Watershed with an open road density of 0.4 mi/mi2. For a description of each LAU in its entirety, see Appendix C.

C1b. Late-Successional Associated Wildlife Species

The Tonasket Sub-Basin does not manage for the Late Successional Reserve Land Allocation.

C1c. Riparian Dependent Wildlife Species

Riparian reserves are limited within the Tunk Creek Watershed and only occupy 186 acres (0.1%). The open road density within the riparian reserves is moderate, at 1.0 mi/mi^2.

C1d. Ungulates

The Tunk Creek Watershed provides a moderate amount of mapped ungulate winter range, approximately 3,986 (2.1%) acres with a low road density of 0.5 mi/mi^2.

C1e. Unique Habitats

Lands managed by the Okanogan and Wenatchee National Forests occur on a small portion of this Watershed. Good snag patches are located in the unroaded portions of Beehive Mountain and Tunk Mountain.

C-2. Wildlife: Chewiliken Watershed

The existing wildlife conditions are included in the Bonaparte watershed wildlife section.

Similkameen Sub-Basin

Similkameen River Watershed

A. Human Use

A1. Public Use

There are four developed recreation sites within the Similkameen Watershed: the State's North Fork-Nine Mile, Toats Coulee and Cold Springs Campground, and the National Forest's Fourteen Mile Campground. The key dispersed recreation activities in the watershed include snowmobiling, cross-country skiing, motorized driving for pleasure, horseback riding, forest product gathering, hiking, ATV-ORV riding, snowshoeing, hunting, and trapping. The watershed provides Roaded Modified, Roaded Natural, Semi Primitive Non-Motorized, and Primitive recreation opportunities. The Similkameen Watershed incorporates a portion of the Pasayten Wilderness.

There are six developed trails and two trailheads in the watershed: Deer Park Trail #341, Clutch Creek Trail #343, Albert Camp Trail #375, Four Point Trail #376, Middle Fork Trail #387 and Boundary Trail #533. Irongate and Fourteen Mile are the two trailheads, and they are both popular points of entry into the Pasayten Wilderness.

There are dispersed campsites located throughout the watershed. Most of the use at these dispersed sites occurs in the summer and fall. These sites usually consist of a flat area where a vehicle and tents can be placed. Structures for hanging game and rock fire rings are common at these sites. Many users often return to the same dispersed site year after year.

A2. Resource Management

Livestock grazing occurs annually throughout National Forest lands within the watershed. All of the National Forest acreage, except for the Pasayten Wilderness, is primary range within the Antoine Allotment and is actively grazed at some point during the grazing season. No grazing is permitted within the Pasayten Wilderness, though trespass livestock are occasionally found near the perimeter due to downed fences or gates left open inappropriately.

The Similkameen Watershed most likely includes eight biophysical environments: non-forest,

hot-dry, warm-dry, cool-dry, cool-mesic, cold-dry, cold-mesic, and very moist. The potential for wildland fire is approximately one fire per year or ten per decade. Because of the unknown fire occurrence on State and private lands, the total fire potential for the entire watersheds is unknown.

Risk of fire may increase in this watershed area over the next few decades due to: increased human activities including recreation and development, and increased fuel loadings due to timber stand collapse from insect infestations and stand stagnation. Large acreages of lodgepole pine that exist within the Similkameen Watershed have seen substantial mortality due to mountain pine beetle activity. These conditions increase risk of intense, difficult to control wildland fires.

Noxious weed surveys have been completed in the watershed. Most of the weed populations were identified prior to 1997 and the sites were analyzed under the Okanogan National Forest Integrated Weed Management Environmental Assessment (USDA FS 1998a).

Affected acres are those acres surrounding and including existing weed populations that contain seed banks or are readily available for weed introduction. The species and Okanogan County and Forest Service classifications are listed below, followed by a definition of each classification.

Table 9. Known noxious weeds within the assessment area

Species	Okanogan County Classification	Forest Service Classification
Diffuse and Spotted knapweed	C and B-Designate	New invader
St. John's wort	C	New invader
Sulfur cinquefoil	B-Designate	New invader
Common houndstongue	C	New invader
Meadow hawkweed	B-Designate	New invader
Orange hawkweed	B-Designate	New invader
Absinth wormwood	Not listed	Established invader
Canada thistle	C	Established invader
Bull thistle	C	Established invader

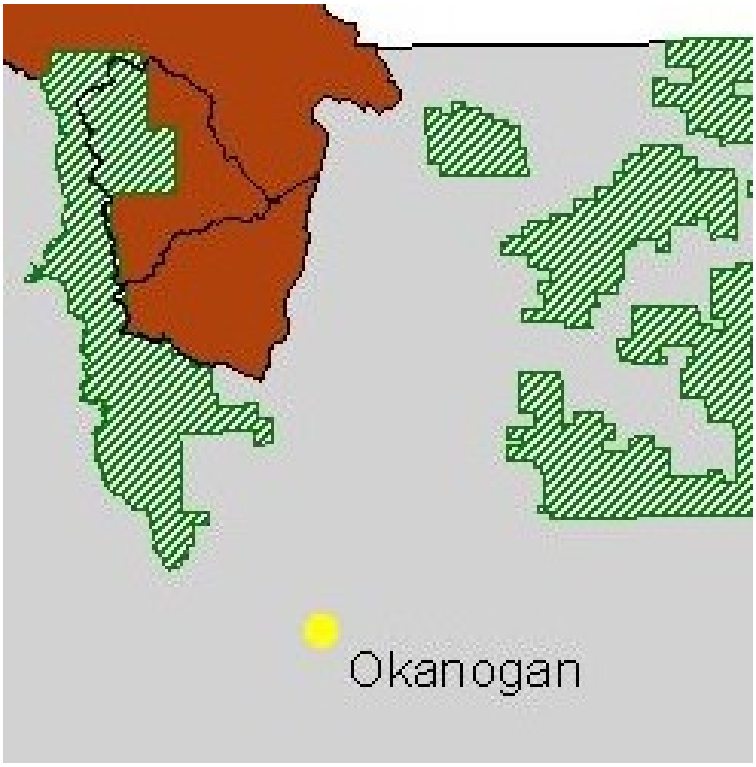
Class B-Designate and new invader weed species are those not native to the state or county, which are of limited distribution or are unrecorded in the region, that pose a serious threat to the region, and whose populations are such that all seed production can be prevented within a calendar year.

Class C weed, established invader species are all other noxious weeds.

B. Aquatics: Similkameen Watershed (Toats Coulee and Sinlahekin Sub-Watersheds)

The focus of discussion is the Similkameen River "watershed." The Forest Service manages 40% of the lands within Toats Coulee Sub-Watershed and 1% of the Sinlahekin Sub-Watershed, both located in the Similkameen "watershed." Toats Coulee is the emphasis of discussion.

Figure 5. Tonasket Ranger District managed lands and U.S. portion of the Similkameen Sub-Basin



Toats Coulee Creek flows into Sinlahekin Creek. Sinlahekin Creek, then flows into the 2,110 acre and 70 foot deep Palmer Lake where effectively all sediment is deposited.

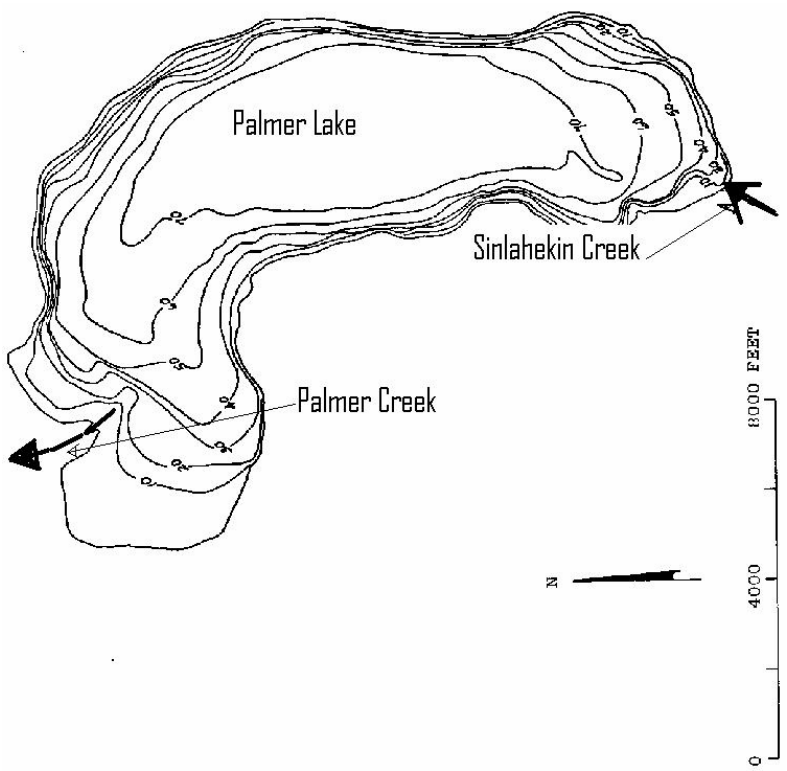
The Sinlahekin Sub-Basin drains 78,110 acres. The Tonasket Ranger District, shown crosshatched in Figure 3, manages 853 acres near the ridge tops.

The Sinlahekin Sub-Watershed has no at-risk fishes present. The waters leaving the Forest Service lands are not fish bearing. Forest road 3900 crosses the ridgeline in this sub-watershed. No known sediment problems occurring from road maintenance here.

The Sinlahekin sub-watershed rated 1 for most indicators, and 0 for Geological Hazard and At-Risk Fish.

The Toats Coulee Sub-Basin drains 86,760 acres. The Tonasket Ranger District, shown crosshatched in Figure 3, manages 39% of this land.

Figure 6. Diagram of inlet and outlet of Palmer Lake



The Toats Coulee Sub-Watershed, which includes Little Horseshoe, Middle Fork Toats Coulee, North Fork Toats Coulee, Deer Park Creeks, is considered significant due to the presence of fish that have the outward appearance of pure strain redband trout. No roads exist on or adjacent to Deer Park or Little Horseshoe Creeks at this time. The areas where most of the redband trout morphs are located are within the Pasayten Wilderness. The exception is Middle Fork Toats Coulee Creek. Notably, the Forest System Road 3900000 road culvert is an upstream migration barrier that keeps the fish in the upper part of the Middle Fork Toats Coulee isolated from other stocks that inhabit the stream below. A road management question is whether or not to provide passage through the culvert on Forest Road 3900000 road. No genetic testing has been done on the populations above or below the Forest Road 3900000 road barrier.

A stream survey of Middle Fork Toats Coulee Creek in 1994 found three miles of stream above Forest Road 3900000 road inhabited by what are suspected to be native redband trout. This population is large and self-sustaining (Cooper 1994-2000).

For this roads analysis, Toats Coulee Sub-Watershed is considered significant for redband trout, and was treated as if these populations were part of an at-risk species because of the small population size, and the limited and isolated nature of the populations and habitat. These populations may be the last remnants of the native populations. No genetic analysis of these populations has been conducted.

B1. Geologic Hazard – Score 3

Stream substrate is dominated by cobble and very small angular "gravel" or a very coarse angular "sand" approximately 2mm in size. This sand fills spaces between cobbles and small boulders that are generally greater than half-buried where stream gradients are less than 4%. This is the case for the North and South Forks too. The hillsides rill and slump after hot fires burn the vegetation, dominated by lodge pole pine in the upper un-roaded portions. No road slumps occur within the Forest Service boundary, but road cuts on the road maintained by Forest Service regularly leak soil and appear to be unstable. This condition is most notable along Toats Coulee Creek mainstem.

B2. Road-Related Fine Sediment - Score 1, 6

The main arterial up the Middle Fork Toats Coulee, Forest Road 3900000, is paved and has a small cut slope to the crossing at Long Swamp. The maintenance and existence of this road adds little sediment. The watershed is rated as Functioning Appropriately for fine sediment, transportation system consistent with the ACS.

The main arterial up the Toats Coulee, road 3900000, is paved and has a small some large cut slopes below Forest Service boundary. The maintenance and existence of this road adds significant sediment to Toats Coulee Creek. A "large" road cut exists where the road 3900000 crosses the North Fork Toats Coulee creek. This area annually adds a couple tons of fine sediment to North Fork Toats Coulee Creek. Addition of sediment from Forest Road 3900000 from outside of the Forest Service boundary is rated as At Risk for fine sediment, roads are felt to be a major source of fine sediment and road system is inconsistent with ACS.

B3. Floodplain Function – Score 3

Only at the crossings of Middle Fork Toats Coulee and Long Swamp Creeks does Forest road 3900000 come within the floodplain. Dispersed recreation is also light but shows a trend of increasing on the Middle Fork Toats Coulee. Some arterial and collector roads are located in the valley bottoms and are causing minor stream confinement. Dispersed recreation access is not resulting in adverse impacts to the floodplain and stream banks. Floodplain connectivity is rated as Functioning Appropriately; Riparian Conservation areas are rated as Functioning Appropriately or if rated as Functioning at Risk, the rating is not due to dispersed recreation or the road system.

B4. Flow Effects – Score 1

Little change identified. Roads are not greatly impacting watershed function. Road density and location, change in peak/base flows are Functioning Appropriately.

B5. At-Risk Fish Populations

At-risk populations are present with significant sub-watersheds for one or multiple species and habitat connectivity exists within the watershed. Table 10 provides a summary of the aquatic rating for all the watersheds with the Similkameen Sub-Basin.

Table 10. Summary of sub-basin indicators

Sub-basin	Watershed	Geologic hazard	Rd-related fine sed.	Flood-plain funct.	Flow effects	At-risk fish	Total rating
Similkameen	Similkameen/ Toats (Rated excluding 3900000 cost-share portion of road, off-forest)	3	1	3	1	6	14
Similkameen	Similkameen/ Sinlahekin	0	1	1	1	0	3

San Poil Sub-Basin

West Fork San Poil River Watershed

A. Human Use

A1. Public Use

Recreation is very important to the local residents who live within the watershed and surrounding area. Use by the local residents is moderate to high, and is low for non-residents, except during hunting season in the fall of the year, when it is high. Camping and fishing are popular summer activities. In the fall, the activities focus on firewood gathering, camping, hunting, and driving for pleasure to view the fall colors.

Lyman Lake, Crawfish Lake, Lost Creek, and Barnell Creek have become popular for recreation fishing. Today two campgrounds remain in the watershed. Lyman Lake has a carrying capacity of 20 people at one time, and in 1995 had 535 visitor days. Crawfish Lake campground has a carrying capacity of 100 people at one time, and in 1995 had 945 visitor days. This campground fills up on peak weekends.

There are two other primitive campgrounds; the San Poil and Aeneas Spring campgrounds. A number of dispersed campsites fall within the watershed on National Forest System land; Peony Creek Hunter camp, Turner Lake, and the old San Poil and Aeneas spring campgrounds.

The watershed has several stock trails that are used by the public for horseback riding, hiking, and hunting. None of these trails are on the Forest Service trail system.

A2. Resource Management

The biophysical environment and fire return interval for the watershed are summarized in Table 11.

Insect infestations, windthrow and fire are the major vegetation altering disturbances within the West Fork San Poil Watershed area. The fire scars and fire affects on the landscape are obvious to the eye. Evidence in the form of fire scars on residual trees, charred woody material, vegetative species composition, age and structure indicate that both low intensity surface fires and higher intensity stand replacing fires occurred on these sites.

Noxious weeds have been located in most areas where ground disturbance has occurred. Within the watershed, Colville Reservation lands have small, scattered populations of noxious weeds. However, high populations of St. John's wort, Scotch thistle, and diffuse knapweed plague noxious weed control efforts on parts of the reservation south of the watershed. Treatment of these weeds is anticipated to begin in 1997.

Table 11. Summary of biophysical environment and fire intervals

Biophysical environment	Fire ecology group	Percent of watershed	Fire return interval
Open	0	12%	Varies
Hot-dry	1	8%	6-10 years
Warm-dry	3	3%	10-24 years
Cool-dry	4	49%	10-40 years
Cool-mesic	5	20%	40-100 years
Cold-dry and Cold-mesic	7	4%	100-150 years
Very moist	8	4%	150 + years

Canada thistle (*Cirsium arvense*) is widespread throughout the watershed where logging activities caused disturbance. Infestations of three different knapweed species, diffuse (*Centaurea diffusa*), spotted (*C. biebersteinii*), and Russian (*Acroptilon repens*), occur primarily in and along road right of ways, gravel pits, and hay ground. Spread is occurring along these areas and into undisturbed sites. Some of these patches have grown to several acres in size. Musk thistle (*Carduus nutans*) occurs on Dugout Mountain as well as along the north portion of the watershed in the Frosty Creek drainage. New infestations of orange and meadow hawkweed (*Hieracium aurantiacum*) have been discovered north of Crawfish Lake as well as being scattered through three of the five sub-watersheds. Sulfur cinquefoil (*Potentilla recta*) is present in many areas and is thought to be widespread. Common St. John's wort (*Hypericum perforatum*) populations continue to explode primarily in the West Fork Sub-Watershed. Other noxious weeds of concern that occur include Dalmatian toadflax (*Linaria dalmatica ssp. dalmatica*), Scotch thistle (*Onopordum acanthium*), and common tansy (*Tanacetum vulgare*).

There are nine active grazing allotments. Four of these are entirely within the watershed, and five have portions in the watershed.

The information for this section was drawn from the San Poil Watershed analysis (USDA FS 1997c).

B. Aquatics

The West Fork San Poil Watershed drains 67,140 acres. The Tonasket Ranger District, shaded in dark gray (green) in Figure 1, manages 54% of this land.

In the West Fork San Poil Watershed, Aeneas Creek Sub-Watershed is considered significant due to what appear to be pure redband trout. Genetic analysis has not been completed on this population. This population is considered significant for redband trout and is treated as an at risk species because of the small size, and the limited and isolated nature of the habitat. This population may be remnant of the native populations. The subsistence fisheries of rainbow trout and kokanee of the mainstem San Poil River are significant fish populations.

A point of note is that the kokanee run has two distinct races. One race is unlike any of the adjacent hatchery stock populations in the Columbia. This race is similar to kokanee that make a run up Nespelem Creek. At this time it is unknown if this population will be considered a "new population" of kokanee and until it is determined this population warrants special recognition. The presence of an active beaver complex on the West Fork San Poil effectively slows velocities and allows much of the suspended materials to fall out of the water column.

B1. Geologic Hazard – Score 0

This watershed is for the most part gentle sloping hills with rock outcroppings. The highest elevations are vegetated with lodge pole.

B2. Road-Related Fine Sediment – Score 6

The entire watershed it is rated a 6. The rating to the fishery in the San Poil River is 1 due to beaver ponding and wetland filters downstream in the West Fork San Poil River. Significant input of sediment from roads to Aeneas Creek has occurred in the past, and is likely to continue. Watershed is rated as At Risk for fine sediment, roads are felt to be a major source of fine sediment and road system is inconsistent with ACS.

B3. Floodplain Function – Score 6

There are no problems with dispersed recreation in sub-watersheds, but bank trampling from cattle does occur in this watershed along the roads; if not, we must assign a rating of 3 because of the "and" statement. Roads are altering floodplain in Barnell, Lost, and Aeneas Sub-Watersheds. Main arterial and/or collectors are constricting streams so that floodplain connectivity is rated At Risk and /Riparian Habitat Conservation Areas are rated as At Risk due to dispersed recreation (cattle trampling); or if there is concern over potential dispersed use even if Riparian Habitat Conservation Areas are currently Functioning Appropriately. Cattle use is not consistent with ACS or appears to be moving towards being inconsistent with ACS.

B4. Flow Effects – Score 3

This watershed like many on the eastern side of the Okanogan River has gentle rolling hills. Large cut and fill slopes were not needed to make the Forest Service transportation system on the east side of the Okanogan River. Road density and location are Functioning at Risk but change in peak/base flows is Functioning Appropriately.

B4. At-Risk Fish Populations – Score 3

At-risk fish are present with one or two significant sub-watersheds for a single species or in some

cases multiple species but habitat and populations are fragmented or isolated within the watershed.

C. Wildlife

The West Fork San Poil River Watershed is a large watershed (126,115 acres) with a high open road density. The watershed consists of mixed ownership land and experiences high human recreational use, throughout the year. Therefore, the potential to improve habitat is moderate.

C1. Wide-Ranging Carnivores

Core habitat is limited in the West Fork San Poil River Watershed. Approximately 19.1% of the watershed is core habitat, for a total of 24,085 acres. All core habitat is located off of Forest Service land. The current open road density is high, at 2.44 mi/mi^2. Portions of the Dugout, Maple, and Tunk LAUs are located within the West Fork San Poil River Watershed. The following table describes the road density of those portions within the West Fork San Poil River Watershed. For a description of each LAU in its entirety, see Appendix C.

Table 12. Road density of Lynx Analysis Units within the West Fork San Poil River Watershed

LAU	Miles of open road	Area w/in watershed (mi^2)	Road density (mi/mi^2)
Dugout	9.7	5.9	1.6
Maple	21.8	11.7	1.9
Tunk	74	32.2	2.3

Mean Road Density = 1.9 mi/mi^2

C2. Late-Successional Associated Wildlife Species

The Tonasket Sub-Basin does not manage for the Late Successional Reserve Land Allocation.

C3. Riparian Dependent Wildlife Species

Riparian reserves within the West Fork San Poil River Watershed occupy 2,615 acres (2.1%). The open road density within the riparian reserves is very high at 4.1 mi/mi^2.

C4. Ungulates

The West Fork San Poil River Watershed provides the greatest amount of mapped winter range within the Tonasket Sub-Basin. Approximately 30,141 acres (23.9%) of the watershed are mapped as winter range for ungulates with a high open road density of 2.3 mi/mi^2.

C5. Unique Habitats

Cox Meadows, Lost Creek Meadow, and Barnell Meadow are along the southern boundary of this watershed, near the Colville Reservation. Scattered ponds, wetlands, and aspen patches occur throughout the watershed. Crawfish Lake is also located along the southern boundary near the Colville Reservation. Within this watershed, approximately half of the areas classified as deciduous and a quarter as wetland, occur on Forest Service lands. Cliffs are present near Devils Canyon, Dugout Mountain, and breaks along the West Fork San Poil River.

West Fork Granite Creek Watershed

A. Human Use

The Human Uses conditions for West Fork Granite Creek Watershed are included in the Human Uses portion in the West Fork San Poil Watershed discussion.

B. Aquatics

The West Fork Granite watershed drains 18,782 acres. The Tonasket Ranger District, shaded in dark gray (green) in Figure 3, manages 32% of this land.

In the West Fork Granite, Sweat and Maple Sub-Watersheds are considered significant due to what appear to be pure redband trout. Genetic analysis has not been completed on any of the populations. Even so, these three sub-watersheds are considered significant for redband trout and are treated as if these populations were part of an at-risk species because of the small population size, limited and isolated nature of the populations and habitat, and because these populations may be the last remnants of the native populations.

B1. Geologic Hazard – Score 0

West Fork Granite Watershed has a similar geology to Toroda Watershed.

B2. Road-Related Fine Sediment – Score 3

Watershed is rated as At Risk for fine sediment, road system is a contributor to fine sediment but is not felt to be a major contributor and road system is generally consistent with ACS.

B3. Floodplain Function – Score 1

Cattle-trampling in Sweat Creek has been reduced since the watershed assessment draft reports due to relocation of the cattle push trail up slope of the stream banks. The trail relocation work was done by Bert Jellison, a caring land steward who recently passed away. Main arterials and collectors are not located in valley bottoms or if located in valley bottom are neither constricting the channels nor providing dispersed recreation access which is diminishing floodplain function. Floodplain Connectivity and Riparian Reserves are rated as Functioning Appropriately. (Highway 20 was not considered in this rating since it is not under Forest Service jurisdiction.)

B4. Flow Effects – Score 1

Roads are not greatly impacting watershed function. Road density and location, change in peak/base flows, are functioning appropriately.

B5. At-Risk Fish Populations

In the San Poil Sub-Basin, Sweat and Maple Sub-Watersheds of West Fork Granite are considered significant due to what appear to be pure redband trout. Genetic analysis has not been completed on any of the populations. The subsistence fisheries of rainbow trout and kokanee of the mainstem San Poil River are significant fish populations. At-risk fish are present with one or two significant sub-watersheds for a single species or in some cases multiple species but habitat and populations are fragmented or isolated within the watershed. Table 13 summarizes the aquatic rating for all the watersheds with the San Poil Sub-Basin.

Table 13. Summary of sub-basin indicators

Sub-basin	Watershed	Geologic hazard	Rd-related fine sed.	Flood-plain funct.	Flow effects	At-risk fish	Total rating
San Poil	West Fork San Poil	0	6	6	3	3	18
San Poil	West Fork Granite	0	3	1	1	3	8

Compiled information from specialist draft reports for West Fork Granite Creek watershed assessment team. Though not completed, this is the best available data.

C. Wildlife

The West Fork Granite Creek Watershed is a small watershed (57,991 acres) that consists of multiple use land. Human use within this area is moderate; therefore, the potential to improve habitat is moderate.

C1. Wide-Ranging Carnivores

Core habitat is limited in the West Fork Granite Creek Watershed. Approximately 29.1% of the watershed is core habitat, for a total of 16,865 acres. The current open road density is high, at 2.24 mi/mi^2. All core habitat is located off Forest Service land. A 24.2mi^2 portion of the Maple Lynx Analysis Unit is located within the West Fork Granite Creek Watershed. This area has a low open road density of 0.8mi/mi^2. A 13.2 mi^2 portion of the Swan Lynx Analysis Unit is also located within this Watershed. This area has a high open road density of 2.3 mi/mi^2. For a description of each LAU in its entirety, see Appendix C.

C2. Late-Successional Associated Wildlife Species

The Tonasket Sub-Basin does not manage for the Late Successional Reserve Land Allocation.

C3. Riparian Dependent Wildlife Species

Riparian reserves within the West Fork Granite Creek Watershed are limited and occupy only 753 acres (1.3%). The open road density within the riparian reserves is very high at 3.5 mi/mi^2.

C4. Ungulates

The West Fork Granite Creek Watershed provides 6,431 acres (11.1%) of mapped winter range for ungulates. The open road density within this winter range is quite low at 0.05 mi/mi^2.

C5. Unique Habitats

Cliffs are present near Fir Mountain. A few scattered small patches of aspen are present throughout the watershed. Good snag patches occur in the unroaded portions of Maple and Clackamas Mountains.

Kettle Sub-Basin

Toroda Creek Watershed

A. Human Use

A1. Public Use

There are two developed recreation sites within the Toroda Creek Watershed, and the Beth Lake and Beaver Lake Campgrounds. The key dispersed recreation activities in the watershed include snowmobiling, motorized driving for pleasure, horseback riding, forest product gathering, hiking, ATV-ORV riding, snowshoeing, hunting, and trapping. The watershed provides Roaded Modified, Roaded Natural, and Semi-Primitive Non-Motorized recreation opportunities.

There are four developed trails in the watershed: Virginia Lilly Trail #322, Beth Lake Trail #316, Big Tree Trail #311, and Strawberry Mountain Trail #309.

There are dispersed campsites located throughout the watershed. Most of the use at these dispersed sites occurs in the summer and fall. These sites usually consist of a flat area where a vehicle and tents can be placed. Structures for hanging game and rock fire rings are common at these sites. Many users often return to the same dispersed site year after year.

Livestock grazing occurs annually throughout National Forest lands within the watershed. All of the National Forest acreage is primary range within the Hull and Haley Allotments and is actively grazed at some point during the grazing season.

A2. Resource Management

The Toroda Creek watershed most likely includes eight biophysical environments: non-forest, hot-dry, warm-dry, cool-dry, cool-mesic, cold-dry, cold-mesic, and very moist. The potential for wildland fire is approximately one fire per year or ten per decade. Because of the unknown fire occurrence on State and private lands, the total fire potential for the entire watersheds is unknown.

Risk of fire may increase in this watershed area over the next few decades due to increased human activities (including recreation and development) and increased fuel loadings due to timber stand collapse from insect infestations and stand stagnation, particularly within the roadless areas. In addition to the increased fire hazard, fire control efforts would be hampered by high-level dead and downed material, causing delayed fire fighter access and contributing to conditions where intense burning can occur. These conditions increase risk of entrapment and injury to firefighters and the public. Also, road access to National Forest lands is generally poor, because portions of three inventoried roadless areas are within the watershed.

Noxious weed surveys have been completed in the watershed. Most of the weed populations were identified prior to 1997 and the sites were analyzed under the Okanogan National Forest Integrated Weed Management Environmental Assessment (USDA FS 1998a).

Affected acres are those acres surrounding and including existing weed populations that contain seed banks or are readily available for weed introduction. Table 14 lists the species and Okanogan County and Forest Service classifications. The following table shows a definition of each classification.

Table 14. Known noxious weeds within the assessment area

Species	Okanogan County classification	Forest Service classification
Diffuse and spotted knapweed	C and B-Designate	New invader
St. John's wort	C	New invader
Sulfur cinquefoil	B-Designate	New invader
Common houndstongue	C	New invader
Meadow hawkweed	B-Designate	New invader
Orange hawkweed	B-Designate	New invader
Musk thistle	B-Designate	New invader
Absinth wormwood	Not listed	Established invader
Canada thistle	C	Established invader
Bull thistle	C	Established invader

Class B-Designate and New Invader weed species are those not native to the state or county, which are of limited distribution or are unrecorded in the region, that pose a serious threat to the region, and whose populations are such that all seed production can be prevented within a calendar year.

Class C weed, Established Invader species are all other noxious weeds.

B. Aquatics

The Toroda Watershed drains 104,457 acres. The Tonasket Ranger District, shaded in dark gray (green) in Figure 1, manages 47% of this land. Toroda Creek flows northerly in a valley less than one-half mile wide. The mountains on each side are vegetated with Douglas-fir and ninebark, suggesting poor, shallow soils and high fire intensities. Most of the Toroda Creek valley is privately owned. Irrigated hayfields, using the creek as the water source, have replaced the natural vegetation where the valley is broad enough to let enough light in to grow grass. Toroda Creek has average summer flows less than 10 cfs and in the summer of 2001 had a flow of less than 5cfs in the stream near the confluence with the Kettle River. Without irrigation withdrawals occurring, the stream flow would remain less than 20 cfs.

Stream surveys have found rainbow trout, rainbow crossed with cutthroat trout, eastern brook trout, and sculpins in the watershed. No at-risk species were found or have been documented in the watershed. The potential of more pure redband trout is possible in Cougar Creek because of the distance from stocked streams and lakes. No genetic samples have been analyzed from Cougar Creek. For prioritizing the District, the population in Cougar Creek is considered as potential redband trout.

Road management in the Cougar Creek Sub-Watershed is limited. The headwaters of the Cougar and T1 to West Fork Cougar Creeks are within the Clackamas Roadless Area.

To date, a watershed assessment for Toroda Creek has not been written. The field data that has

been collected for the watershed assessment, to be written in the future, is the best available data.

B1. Geologic Hazard – Score 0

On the ground, the sideslopes in this watershed appear stable with much angular rock. Sheet erosion does occur on the dry upper slopes. These are associated with over grazing (Messerlie 1998). No slump areas have been identified in the field.

B2. Road-Related Fine Sediment – Score 6

Annually this watershed would be rated a 3, but with a just one rain event centered in Marias Creek, a long section of road would wash out, and has before. This is also the case with Cumberland Creek, a portion of Cougar Creek, and a small area of Nicholson Creek. Much of the material would wash through to the Kettle River because these streams and Toroda Creek have no functioning depositional areas. This bedload would stress all ready unstable banks in Toroda Creek and create a chain reaction of bank erosion down the valley. This rates a 6 because of the potential to add much fine sediment to the Kettle River. Watershed is rated as At Risk for fine sediment, roads are felt to be a major source of fine sediment, and road system is inconsistent with ACS.

B3. Floodplain Function – Score 6

Nicholson, Marias, and Cumberland Creeks have streams very near and have had fire woodcutting remove much of the down and standing LWD. In Nicholson and Marias it continues. Dispersed camping is not a concern in this watershed, but the floodplain function should still be rated 6. Since the main arterial and/or collectors are constricting streams and the amount of dispersed use or potential dispersed use in the area, the floodplain connectivity is rated At Risk and Riparian Habitat Conservation Areas are rated as At Risk. Dispersed use is not consistent with ACS or appears to be moving towards being inconsistent with ACS.

B4. Flow Effects – Score 6

Several roads, because of their proximity to the stream, have removed vegetation and changed channel morphology over a long period of time and undoubtedly altered the peak and base flows, which has created higher velocities for short periods of time in the watershed. This is not in flux on “normal” flow years, but with storm events flows are not dissipated and have detrimental effects to their channels and the channels downstream, so it does alter the timing of runoff and increase peak flows but is not likely to alter the base flows. The peak flows on unusual high runoff years has the potential to increase dramatically with debris and sediment additions, (molar agents, like road fill, firewood rounds etc.)

This condition rates a 3 on “normal” water runoff years, and 6 on the 7-11 year cycle and 6 during 50 year events. Road density and location are Functioning At Risk or Unacceptable Risk and change in peak/base flows is Functioning At Risk.

B5. At-Risk Fish Populations – Score 3

At-risk fish are present with one or two significant sub-watersheds for a single species or in some cases multiple species but habitat and populations are fragmented or isolated within the watershed.

C. Wildlife

The Toroda Creek Watershed covers a large area (104,458 acres) of mixed ownership lands. There is potential for improvement within the watershed, though it may be limited by human use.

C1. Wide-Ranging Carnivores

The open road density in the Toroda Creek Watershed is moderate at 1.95 mi/mi^2. Approximately 31.2% of the watershed is core habitat, for a total of 32,584 acres. All core habitat is located off of Forest Service land. Portions of the Bonaparte, Bodie, and Maple LAUs are located within the Toroda Creek Watershed. The following table describes the road density of those portions within the Toroda Creek Watershed. For a description of each LAU in its entirety, see Appendix C.

Table 15. Road density of Lynx Analysis Units within the Toroda Creek Watershed

LAU	Miles of open road	Area w/in watershed (mi^2)	Road density (mi/mi^2)
Bonaparte	36.3	13.6	2.7
Bodie	7.7	5.4	1.4
Maple	0.5	10.4	0

Mean Road Density = 1.4 mi/mi^2

C2. Late-Successional Associated Wildlife Species

The Tonasket Ranger District does not manage for the Late Successional Reserve Land Allocation.

C3. Riparian Dependent Wildlife Species

Riparian reserves occupy 2,557 acres (2.4%) of the Toroda Creek Watershed. The Toroda Creek Watershed's riparian reserve open road density of 4.4 mi/mi^2 is the highest in the Tonasket Sub-Basin.

C4. Ungulates

The Toroda Creek Watershed contains a large amount of mapped winter range. There are approximately 13,990 acres (13.4%) of winter range with a moderate open road density of 1.4 mi/mi^2.

C5. Unique Habitats

Cliffs are present in Box Canyon, north of Coogan Creek, and above Harvey Creek and O'Connor Canyon. Wetland and cliff habitats occur along Beaver Creek. Talus slopes are present near most cliff habitats and near Vaughn Creek. Scattered small wetlands, ponds, and patches of aspen occur throughout the watershed.

Myers Creek Watershed

A. Human Use

A1. Public Use

There is one developed recreation site within the Myers Creek Watershed: Lost Lake Campground. This site incorporates two private organization camps: Camp Tokiwanee and Camp Ortoha. The key dispersed recreation activities in the watershed include snowmobiling, motorized driving for pleasure, horseback riding, forest product gathering, hiking, ATV-ORV riding, snowshoeing, hunting, and trapping. The watershed provides Roaded Modified, Roaded Natural, and Semi Primitive Non-Motorized recreation opportunities.

There is only one developed trail in the watershed: Mount Bonaparte Trail #306. This trail is the only one on the District currently designated open to motorized vehicles, and it is used both for recreation and to supply the lookout at the top of Mount Bonaparte. There is also a State sno-park and developed cross-country skiing at Highlands Nordic Ski Area. The ski park is maintained under a special use permit with a ski club.

There are dispersed campsites located throughout the watershed. Most use at these dispersed sites occurs in the summer and fall. These sites usually consist of a flat area where a vehicle and tents can be placed. Structures for hanging game and rock fire rings are common at these sites. Many users often return to the same dispersed site year after year.

A2. Resource Management

The Myers Creek Watershed most likely includes eight biophysical environments: non-forest, hot-dry, warm-dry, cool-dry, cool-mesic, cold-dry, cold-mesic, and very moist. The potential for wildland fire is approximately one fire per year or ten per decade. Because of the unknown fire occurrence on State and private lands, the total fire potential for the entire watersheds is unknown.

Risk of fire may increase in this watershed area over the next few decades due to increased human activities including recreation and development, and increased fuel loadings due to timber stand collapse from insect infestations and stand stagnation, particularly within the Mount Bonaparte semi-primitive motorized area. That area has seen substantial mortality due to pine beetle activity amongst lodgepole pine. In addition to the increased fire hazard, fire control efforts would be hampered by high-level dead and downed material, causing delayed firefighter access and contributing to conditions where intense burning can occur. These conditions increase risk of entrapment and injury to firefighters and the public.

Noxious weed surveys have been completed in the watershed. Most of the weed populations were identified prior to 1997 and the sites were analyzed under the Okanogan National Forest Integrated Weed Management Environmental Assessment (USDA FS 1998a).

Affected acres are those acres surrounding and including existing weed populations that contain seed banks or are readily available for weed introduction. The species and Okanogan County and Forest Service classifications are listed in Table 16.

Table 16. Known noxious weeds within the assessment area

Species	Okanogan County classification	Forest Service classification
Diffuse and spotted knapweed	C and B-Designate	New invader
St. John's wort	C	New invader
Sulfur cinquefoil	B-Designate	New invader
Common houndstongue	C	New invader
Meadow hawkweed	B-Designate	New invader
Orange hawkweed	B-Designate	New invader
Musk thistle	B-Designate	New invader
Absinth wormwood	Not listed	Established invader
Canada thistle	C	Established invader
Bull thistle	C	Established invader

B. Aquatics

The Myers "watershed" consists of the U.S. portion of the Myers Creek Watershed and includes Cedar Creek and Jackson Creek, all separate tributaries to the Kettle River. This area drains 72,362 acres. The Tonasket Ranger District, shaded in dark gray (green), manages 35% of this land, mostly high elevation lodge pole pine forest on the north side of Mount Bonaparte.

Myers Creek is in the heart of the Okanogan Highlands, an agriculturally productive area. This land and a majority of the Myers Creek valley are privately owned. Much of it is planted to dry land wheat. Buckhorn Mountain borders the east of the watershed, and is the location of the proposed Crown Jewel Gold Mine.

Field notes and data from stream surveys on Forest Service land make references to eastern brook trout only.

B1. Geologic Hazard – Score 3

Two slump areas have been identified on road 3300000. These areas have been patched but will likely slump again because they are located on a toe slope of sandy soil. Large-scale fire potential in the lodge pole pine forest in the headwaters is present.

B2. Road-Related Fine Sediment – Score 1

This watershed is rated as Functioning Appropriately for fine sediment, transportation system consistent with the ACS.

B3. Floodplain Function – Score 1

Main arterials and collectors are not located in valley bottoms or, if located in a valley bottom, are not constricting the channels nor providing dispersed recreation access which is diminishing floodplain function. Floodplain Connectivity and Riparian Reserves are rated as Functioning Appropriately.

B4. Flow Effects – Score 1

Roads are not greatly affecting watershed function. Road density and location, change in peak/base flows, are Functioning Appropriately.

B5. At-Risk Fish Populations – Score 0, 1

0 = At-risk fish are not present.
1 = At-risk fish are present but there are no significant sub-watersheds. Table 17 summarizes the aquatic rating for all the watersheds with the Kettle Sub-Basin.

Table 17. Summary of sub-basin indicators

Sub-basin	Watershed	Geologic hazard	Rd-related fine sed.	Flood-plain funct.	Flow effects	At-risk fish	Total rating
Kettle	Myers Creek	3	1	1	1	0	6
Kettle	Toroda (Rated with 50 year event in mind)	0	6	6	6	3	21

C. Wildlife

The Myers Creek Watershed is a small watershed (72,363 acres) in the northwest corner of the Sub-Basin. This watershed experiences high road densities and multiple-use.

C1. Wide-Ranging Carnivores

The Myers Creek Watershed is in poor condition with regard to core habitat. The open road density is high at 2.05 mi/mi^2. Only 29.0% of the watershed is core habitat, for a total of 20,952 acres. All core habitat is located off of Forest Service land. A 15.2 mi^2 portion of the Bonaparte Lynx Analysis Unit is located within the Myers Creek Watershed. This area has a moderate open road density of 1.6mi/mi^2. For a description of each LAU in its entirety, see Appendix C.

C2. Late-Successional Associated Wildlife Species

The Tonasket Sub-Basin does not manage for the Late Successional Reserve Land Allocation.

C3. Riparian Dependent Wildlife Species

Riparian reserves occupy approximately 1,462 acres (2.0%) of the Myers Creek Watershed. The open road density within the riparian reserves is high, at 2.1 mi/mi^2.

C4. Ungulates

The Myers Creek Watershed provides a large amount of mapped ungulate winter range, approximately 7,304 (10.1%) acres with a low road density of 0.9 mi/mi^2.

C5. Unique Habitats

The highest concentrations of Western red cedar (*Thuja plicata*), an uncommon species in the Tonasket Sub-Basin, occur along Cedar Creek and its tributaries. Patches of deciduous trees are present southwest of Buckhorn Mountain. A relatively large wetland and pond are present near road 3575, approximately two miles east of the head of Jackson Creek.

II. Analysis

Human Use

The human use portion of the roads analysis identifies the level of importance of the road system to the human use activities in the particular sub-basin or watershed and to further identify the primary activities or combination of activities the road system is used for. Social values vary greatly among users. Further, users with similar interests will have differing perceptions of what constitutes appropriate access. It is not possible to satisfy every individual or group of individuals, nor is it possible to identify what people will desire tomorrow or into the next decade. It is possible to observe trends and at least make some qualitative estimates of what the future needs may be. However, we generally lack sufficient data to make categories of human use that exist today on a broad scale, but will not attempt to make quantitative predications of future needs.

There is a great deal of overlap in social needs so it is important to keep in mind the scale of the population of users being considered: is it small scale/local community, medium scale/multiple community, large scale/regional, or very large scale/national importance? This consideration will help the decision maker determine whether the management of a particular road segment will have a direct or indirect effect on the user.

The human use factors are grouped into broad categories relating to the amount of flexibility the decision maker has; whether the value is expected to be of local, regional or national scale; the current use pattern; and desired future condition. The rating criteria are described in detail in Appendix A. In this analysis, segments with scores of 32 and above were given a high priority, which means there is a "high" need to keep that segment some type of passenger car access. Roads with a score of 21 to 31 received a moderate priority rating and roads with a score of 20 and below were given a low priority rating. Because all road segments received a "high" score for the ROS Class criteria, this criteria is not discussed in detail.

Aquatics

Road segments were placed into high, medium, or low priority for treatment based on the aquatic analysis. The priorities were determined based on the aquatic score for the segment and then verified by local knowledge of the road segment (see Appendix B). High priority segments scored 24 or higher. Medium priority segments scored between 17 and 22, while low priority segments scored under 17. Generally, high priority roads are accelerating fine sediment delivery into streams with at-risk fish and or have constricted stream channels. Roads that were providing dispersed recreation access to riparian habitat were also often ranked high especially where riparian and aquatic habitat impacts have been observed (erosion, streambank damage, loss of large wood for example). The following is a brief description of the high priority roads according to watershed. Because there are no arterial or collector roads in the Early Winters Watershed, no analysis was completed for this watershed.

Only a few high priority road segments located on the Tonasket District were identified as

needing work to reduce aquatic impacts. There are several reasons for this. First, there are no threatened or endangered fish species found on the Forest. Dams and irrigation facilities have blocked access to historical habitat on the Forest. Bull trout do not appear to have been widespread on the National Forest; it appears they have been extirpated from their historical habitat. Finally, many of the streams are very small and contribute very little flow to endangered fish habitat in the Okanogan River. The Salmon Creek Watershed is designated as Critical Habitat for Upper Columbia steelhead but that decision is under review. The primary aquatic species concern is the protection of what may be isolated native redband/rainbow trout populations in the Salmon Creek Watershed, the Toroda Watershed, Aeneas Creek, the West Fork Granite Creek, and Toats Coulee. The streams on the Forest do support popular sport fisheries both on and off the Forest.

The two aquatic high priority road segments are Salmon Meadows road (3800000) and South Fork Salmon road (4200000), both in the Salmon Creek Watershed. The road needs improved drainage; reconstruction at several small slumps and dispersed recreation access from the road to the riparian area should be controlled.

South Fork Salmon road is located directly adjacent to the stream, impinging on the floodplain and contributing to accelerated sediment delivery. Consider relocation.

Eight roads were considered a moderate priority for treatment to reduce aquatic impacts. These segments are discussed in the individual watershed sections which follow the wildlife discussion.

Wildlife

This roads analysis summarizes the results for the Level 3-5 Roads in the Tonasket Sub-Basin. The wildlife categories that were addressed included: wide ranging carnivores, riparian dependent species, ungulates and unique habitats. Because the Tonasket Sub-Basin does not manage land under the Northwest Forest Plan Late Successional Reserve land allocation (USDA FS, et al. 1994), the Late Successional Reserve category was not assessed in this analysis. Road segment priority ratings were determined by summing the category scores derived from the Wildlife Roads Analysis Procedure (see Appendix C).

High-rated road segments generally scored moderate to high in three to four categories. Modification of these segments usually offered the greatest opportunities for improving habitat for wide-ranging carnivores, through creation of core habitat, and/or habitat effectiveness of ungulate winter ranges, young rearing areas and migration routes. Also, numerous opportunities to protect or restore riparian habitat and connectivity or unique habitats are available. High priority segments scored greater than 20 points.

Moderately-rated road segments usually have one element of strong potential, generally improvement of core habitat, and moderate to low potential in the remaining categories. Moderate priority segments scored 11 to 20 points.

Low-priority segments were often characterized by either excellent habitat conditions or very limited restoration opportunities because of current road conditions, such as pavement and high human use juxtaposed with private land. These road segments scored fewer than 11 points.

Because of the high road densities, there are very few roads in this category.

Improvement or creation of habitat suitable for wide-ranging carnivores and enhancement of habitat effectiveness within winter range tend to drive the ratings within the Tonasket Sub-Basin. Because the roads cover a large area and a variety of habitats, the overall rating consists of various combinations of categories. The individual watershed discussions give a general description of those roads with the greatest potential for improvement within each watershed. For more detailed information, see Appendix C.

Okanogan Sub-Basin

Bonaparte Creek Watershed/Chewilikin Creek

A. Human Use

A high human use rating was reached for Sneed Bench (Road 3015000), Bonaparte Creek (Road 3200000), and Mill Creek (Road 3230000). Fir Creek (Road 3100000) received a medium rating.

All of these roads are at an appropriate maintenance level and need no repairs for resource protection.

B. Aquatics

All roads in this watershed received a rating of Low.

C. Wildlife

The road density in the Bonaparte Creek Watershed (BCW) is high at 2.11 mi/mi^2. The road density in the Chewiliken Creek Watershed (CCW) is low, 0.81 mi/mi^2. Of the seven road segments in the BCW/CCW; five (71%) received a moderate rating for potential improvement and two (29%) received a low rating for potential improvement.

High human use and lower habitat values resulted in the moderate and low ratings within this watershed. See Appendix B for further information regarding the road segments in BCW/CCW.

Antoine-Siwash Watersheds

A. Human Use

The portion of Mill Creek (Road 3230000) in the Antione Creek Watershed received a high human use rating, and the portion in the Siwash Watershed received a medium rating. Phoebe (Road 3235000) rated as high in the Antione Creek Watershed, and as a medium in the Siwash Watershed. Box Canyon (Road 3300000) and Summit Lake (Road 3525000) received high ratings.

The following roads are at the appropriate maintenance levels, and do not need repairs: 3230000 (in both the Antione and Siwash), 3235000 (in Antoine), 330000, and 3525000. The portion of

Road 3235000 in Siwash Watershed could be reduced in maintenance level, and needs no repairs for resource protection.

B. Aquatics

All roads in this watershed received a rating of Low.

C. Wildlife

C1. Antoine Creek Watershed

The road density in the Antoine Creek Watershed is high at 2.2 mi/mi^2. Of the four road segments in this watershed, one (25%) received a high rating for potential improvement, two (50%) received a moderate rating for potential improvement, and one (25%) received a low rating.

Mill Creek Road 3230 - Modifications to this road have the greatest potential to improve habitat for wide ranging carnivores. The road currently runs through the Bonaparte LAU and separates areas of core habitat that could be linked across a "saddle." The road is also located in deer winter range.

C2. Siwash Creek Watershed

The road density in the Siwash Creek Watershed is moderate at 1.63 mi/mi^2. Only two road segments in this watershed were analyzed at this level and both segments received a high rating for potential improvement.

Mill Creek Road 3230 - Modification of this road has potential to protect habitat within the Bonaparte LAU and connect fragments of core habitat. The road is also located within deer winter range.

Phoebe Road 3235 - Modification of this road also has the potential to increase the area of small islands of core habitat. The road also runs through deer winter range.

Salmon Creek Watershed

A. Human Use

Gibson Creek (Road 3810000) received a high human use rating. Segments 40 and 42 of South Fork Salmon Creek (Road 4200000) also received a high rating, while segments 39 and 41 received a low rating. Segment 35 of Salmon Meadows (Road 3800000) received a high human use rating, while segment 34 received a medium rating. Middle Salmon Boulder (Road 3700000) received a medium rating.

Roads 3700000, segment 34 of Road 3800000, and Road 3810000 are at an appropriate maintenance level, and do not need repairs for resource protection. Segment 35 of Road 3800000 is at an appropriate maintenance level, but needs major work to mitigate resource impacts. Segment 39 of Road 4200000 also needs major work to mitigate resource impacts, but is at an appropriate maintenance level. Segment 42 of Road 4200000 is at an appropriate

maintenance level, but needs minor repair for resource protection.

B. Aquatics

Gibson Creek (3810000) – The first mile of the road requires high maintenance as cutbanks continue to ravel, accelerating sediment delivery. There may be few options to fix.

South Fork Salmon (4200000, two segments) – Improved drainage is needed.

C. Wildlife

The road density in the Salmon Creek Watershed is moderate at 1.57 mi/mi^2. Of the nine road segments in the analysis; eight (89%) received a high rating for potential improvement and one (11%) received a moderate rating.

Middle Salmon Boulder Road 3700000 (2 segments) - The opportunities for improvement along this road exist primarily in core habitat and lynx habitat improvements through potential elimination of numerous tributaries. Moose and unmapped deer winter range are found within this basin.

Salmon Meadows Road 3800000 - Modification of this road could significantly increase core habitat in areas with moderate to high habitat values. The upper end of this road runs through a deer migration corridor. The remaining categories have consistently moderate potential for improvement.

Gibson Creek Road 381000 - The issues regarding this road are similar to 3700000 and 3800000. However, this road accesses State land and an old lookout, potentially limiting opportunities for improvement.

South Fork Salmon Road 4200000 (4 segments) - This is one of the main access roads into the Salmon Creek Watershed. As such, the road bisects high quality habitat with documented use (sightings) of wolf, grizzly bear, and lynx. The road also runs along South Fork Salmon Creek, creating opportunities for riparian habitat and connectivity restoration.

The Salmon Creek Watershed is a site of high-quality habitat and very high human use. This level of use may limit opportunities for improvement.

Northeast Okanogan (Tonasket) Watershed

A. Human Use

Roads for this watershed are included in the Antoine and Siwash Watersheds discussion.

B. Aquatics

All roads in this watershed received a rating of Low.

C. Wildlife

All roads in this watershed received a rating of Low.

Southeast Okanogan (Fish, Tunk, Chewiliken) Watershed

A. Human Use

Roads for this watershed are included in the Bonaparte Watershed discussion.

B. Aquatics

All roads in this watershed received a rating of Low.

C. Wildlife

The road density in the Tunk Creek Watershed is moderate at 1.02 mi/mi^2. Only one road was considered in this analysis; it received a moderate rating.

High human use and lower habitat values resulted in the moderate rating within this watershed. For more information about the road segment in the Tunk Creek Watershed, see Appendix C.

Similkameen Sub-Basin

Similkameen (Toats, Sinlahekin) Watershed

A. Human Use

Segment 37 of Meadows-Toats (Road 3900000) received a high human use rating. It is at an appropriate maintenance level and does not need repairs for resource protection. Segment 38 received a low rating. It is also at an appropriate maintenance level, but needs minor repairs for resource protection.

B. Aquatics

Meadow-Toats (3900000) – Additional culverts are needed to maintain flow through Long Swamp and improve drainage at slumps.

C. Wildlife

The road density in the Similkameen River Watershed is moderate at 1.04 mi/mi^2. Only two road segments in this watershed were analyzed at this level; both segments received a high rating for potential improvement.

Meadows-Toats Road 3900000 (2 segments) - This road received the highest score within the Tonasket Sub-Basin analysis. Ungulates, wide-ranging carnivores, and unique habitat categories all received maximum scores. This is a major human access road that runs through high quality core habitat in an area of grizzly bear sightings. Modification of this road could substantially increase core habitat. This road currently provides great potential for human disturbance on deer winter range and possibly provides access to mountain goats. These species could benefit from road modifications. There is also potential to protect and restore riparian and wetland habitats

through road modification.

San Poil Sub-Basin

West Fork San Poil River Watershed

A. Human Use

A human use rating of high was reached for the following roads in the West Fork San Poil Watershed: Aeneas (Road 3000000), Peony Creek (Road 3010000), and Coco Mountain (Road 3120000). Fir Creek (Road 3100000) received a medium rating.

Roads 3000000, 3010000, and 3120000 roads are at an appropriate maintenance level, and need no repairs for resource protection. The 3100000 could be reduced in maintenance level, and needs no repairs for resource protection.

B. Aquatics

All roads in this watershed received a rating of Low.

C. Wildlife

The road density in the West Fork San Poil River Watershed is high at 2.44 mi/mi^2. Of the four road segments in the analysis, three (75%) received a high rating for potential improvement and one (25%) received a moderate rating.

Aeneas Road 3000 - Modifications to this road have high potential to improve core habitat for carnivores by joining numerous fragments of core habitat. A groomed snowmobile route bisects ungulate winter range and transition areas. There is moderate potential to improve habitat in riparian areas and in restoring and protecting unique habitats such as wetlands. This road experiences heavy year-round recreational use, which may limit opportunities for habitat improvement.

Fir Creek Road 3100 - This road has moderate potential to improve habitat in all four categories. For more details, see Appendix C.

Coco Mountain Road 3120 - Modifications to this road have the greatest potential to improve habitat for wide-ranging carnivores and ungulates. The road currently separates two LAUs and bisects deer winter range. Modifying the road could also protect unique habitats, such as wetlands and raptor activity sites.

In summary, modification of the roads within the West Fork San Poil River Watershed has great potential to improve habitat for wide-ranging carnivores and ungulates, although human use may be a limiting factor.

West Fork Granite Creek Watershed

A. Human Use

Roads for this watershed are included in the West Fork San Poil Watershed discussion.

B. Aquatics

All roads in this watershed received a rating of Low.

C. Wildlife

The road density in the West Fork Granite Creek Watershed is high at 2.24 mi/mi^2. Of the two road segments in the analysis; one (50%) received a high rating for potential improvement and one (50%) received a moderate rating.

Fir Creek Road 3100 - Modifications to this road have moderate potential to improve habitat conditions for wide-ranging carnivores and ungulates. The potential increases with regard to restoring riparian habitat and connectivity, and in restoring and protecting unique habitats, such as deciduous areas and habitat used by raptors.

Kettle Sub-Basin

Toroda Creek Watershed

A. Human Use

The following roads received a high human use rating: Bonaparte (Road 3200000), Cumberland (Road 3240000), and Nicholson Creek (Road 3575000). Both Box Canyon (Road 3300000) and Marias Creek (Road 3550000) received a medium rating.

Roads 3200000, 3240000, and 3300000 are at an appropriate maintenance level, and do not need repairs for resource protection. Road 3575000 is at an appropriate maintenance level, but a portion needs minor repairs for resource protection. Road 3550000 could be reduced in maintenance level, and needs to repairs for resource protection.

B. Aquatics

Bonaparte Road (320000) – The road is scheduled for resurfacing. A silt fence should be installed along the entire segment to prevent the material from entering the stream

Marias Creek (3550000) – Culverts need to be resized and aligned to provide passage and improve drainage. Ditches need to be improved.

Nicholson Creek (3575000) - Needs improved drainage including ditch work and culverts. Stream crossing designs should include features to prevent water running down the road in case the culvert becomes blocked or during a flood event.

C. Wildlife

The road density in the Toroda Creek Watershed is moderate at 1.95 mi/mi^2. Of the five road segments in the analysis; two (40%) received a high rating for potential improvement and three (60%) received a moderate rating.

Cumberland Road 3240000 - This is a main road within the Toroda Creek Watershed; however, modifications to it could create a large amount of core habitat. The end of the road also enters high quality ungulate winter range, creating high potential for improving ungulate habitat effectiveness through road modifications or seasonal closures. It is important to note that the road accesses the Virginia Lily Interpretive Trail.

Marias Creek Road 3550000 - Modifications to this road could potentially positively impact three of the four wildlife categories. The road currently bisects a large area of core habitat, and runs through riparian habitat and ungulate winter range.

Myers Creek Watershed

A. Human Use

The portion of Nicholson Creek (Road 3575000) in the Meyers Creek Watershed received a high human use rating. Segment 23 of Box Canyon (Road 3300000) received a high rating, and the remaining portion in this watershed received a low human use rating. Lake Road (3400000) also received a low rating.

The entire length of Road 3300000 in this watershed is at an appropriate maintenance level and does not need repair for resource protection. Road 3575000 is also at an appropriate maintenance level, but needs minor repairs for resource protection. Road 3400000 does not need repairs for resource protection, but could be reduced in maintenance level.

B. Aquatics

Nicholson Creek (3575000) - Needs improved drainage, including ditch work and culverts. Design stream crossings so if the culverts become plugged, water does not run down the road.

C. Wildlife

The road density in the Myers Creek Watershed is high at 2.05 mi/mi^2. Of the four road segments in this watershed, two (50%) received a moderate rating for potential improvement and two (50%) received a low rating for potential improvement.

As with Bonaparte Creek Watershed, high human use and lower habitat values resulted in the moderate and low ratings within this watershed. For more information about the road segments in this watershed, see Appendix C.

III. Recommendations

The range of recommended treatments or strategies fit into five general categories ranging from major improvements to decommissioning. The five categories are:

1. Major repair or improvement
2. Minor repair or improvement
3. Leave as is, lower maintenance requirements
4. Stabilize then eliminate maintenance requirements
5. Decommission

Major repairs can include but are not limited to: relocation, replacing a major culvert, or seasonal closure. Minor repairs can include but are not limited to: minor surfacing or grading work, drainage improvements (such as adding cross drains or drain dips), or seasonal closures. "Leave as is" means the current maintenance standards would be maintained with no change. The "lower maintenance requirements" strategy would reduce the current maintenance standard to the next lower standard. For example, a maintenance level 3 road, maintained for passenger cars would be reduced to a road with a maintenance level 2, which is maintained for high clearance vehicles. The "stabilize then eliminate maintenance" strategy would involve stabilizing the road, for example by out-sloping, installing water bars, removing culverts where possible, then inspecting the road periodically to monitor for any damage. Users will notice little change in the short term on the roads with recommended strategies of "lower the maintenance requirements" or "eliminate maintenance after the road is stabilized." The road will be allowed to reach the new standard over time. The decommissioning strategy can involve a range of treatments from ripping and seeding the surface to full obliteration. These categories are described in greater detail in Appendix D.

Some type of change in management strategy was recommended for 12 of the 41 road segments that were analyzed. The recommended changes in strategy ranged from improvements to lowering maintenance levels. Of the 12 recommended changes, two are to make a major improvement of some type to mitigate resource impact while maintaining passenger car access. This accounts for approximately 3 miles; however, in many cases the repair or treatment is at a specific location and not the full length of the road. Minor improvements, such as installing additional cross drains, or seasonal closures, are the recommended strategy on five segments. Five segments, on approximately 18 miles of road, received the recommended strategy to preserve access but reduce the level of maintenance applied to the road. No segments were identified with the recommendation of decommissioning or putting in a self-maintaining state. Only the roads with a recommended change in treatment or strategy are listed in the following tables. For a list of all analyzed roads with the strategies recommended for each, see Appendix D.

If all the recommended strategies were fully implemented, the cost to maintain these roads to full standards would decrease about $145,000 per year for the Tonasket Ranger District, from $686,000 to $541,000 per year. However, a substantial amount would be needed to make all the repairs, and improvements recommended to fully implement all the strategies. At this time, the specific projects needed to implement these strategies are not known in enough detail to develop

cost estimates. On roads which have Cost Share Agreements, the cost share partner must be consulted and agree to any changes in road management. It is important to note that these dollars reflect the needs to maintain only the roads analyzed to the standards defined in the Forest Service Manual. This is not the amount that is currently being spent. The Ranger Districts received a total of approximately $210,000, which was used to maintain all the roads on the system, not only the major arterials and collectors. This discrepancy between funds needed and funds received indicates the need to determine the minimum affordable road system.

Minimum Affordable Road System

The Forest Service defines the minimum affordable road system as the miles of road by maintenance level that can be maintained to full standard with the anticipated maintenance funding. Based on forest average maintenance costs, it would require approximately $1,844,500 annually to maintain all of the system roads in the Tonasket Ranger District. These values do not include the costs for the identified deferred maintenance, the maintenance needed to bring the road back up the standard described in the Forest Service Manual, or the funds needed to improve fish passage by repairing or replacing barrier culverts. In Fiscal Year 2000 approximately $210,000 (15% of the estimated annual need) was expended for maintenance on the roads in the Wenatchee Sub-Basin. However, rather than maintaining a small percentage of the roads to full standard, the work was distributed over a greater mileage to address high priority needs.

Budget projections indicate that funding for road maintenance will continue at current levels for the foreseeable future. Consequently, $210,000 was selected as the planned amount for the minimum affordable road system for the sub-basin. Based on that funding level and the average costs per mile by maintenance level, the following table shows the extremes in the range of potential road management scenarios. In Table 18, Option A shows the number of miles of road that can be maintained to standard, starting with the level 2 (high clearance vehicle) roads. The number in parenthesis is the percent of the total system roads in the sub-basin that would be maintained to standard. Option B shows the number of miles of road that can be maintained to standard starting with the level 3-5 (passenger vehicle) roads first. From a practical standpoint, the minimum affordable system would likely be a combination of arterials and collectors maintained for passenger cars, and local roads maintained for high clearance vehicles.

Table 18. Minimum affordable road system options

Maint. level	Option A		Option B	
	mi.	(% of total)	mi.	(% of total)
ML 2 (high cl.)	208	(15)	0	(0)
ML 3-5 (pass.)	0	(0)	55	(4)

This analysis demonstrates there are many more miles of roads than can be fully maintained with the expected funding. However, a rapid reduction in accessible road mileage is not acceptable to a large segment of forest users, would not meet agency management access needs, and would incur significant expenses to properly implement.

As stated above, this analysis does not recommend any road segments be decommissioned. Future studies that will analyze the local roads (those maintained for high clearance vehicles) have the potential to recommend decommissioning some roads in an effort to adjust the size of the road system.

Okanogan Sub-Basin

Bonaparte Creek Watershed

The recommendation for all roads within this watershed is to leave them as is.

Antoine-Siwash Watersheds

The recommendation for Phoebe Road (3235000) is to lower the maintenance standard from a level 3 (accessible to passenger cars) to a level 2 (maintained for high clearance vehicles) for the 3.4 miles segment within the Siwash Watershed. All other roads received a recommendation of "leave as is."

Table 19. Antoine-Siwash Watersheds recommendations

Road name	FS rd. #	Seg. length (mi)	Aquatic rating	Wildlife rating	Human use rating	Draft recom. mgmt.	Final recom. mgmt.
Phoebe	3235000	3.4	L	H	M	Lower maint.	

Salmon Creek Watershed

Within the Salmon Creek Watershed two roads received a recommendation of "major repair or improvement," one road received a recommended strategy of "minor repair, improvement or seasonal restrictions," and two were given the recommendation of "lower the maintenance standard." All other roads analyzed in the drainage received "leave as is" recommendations. Table 20 summarizes the recommendations.

The recommendations for Salmon Meadows road (3800000) are to repair the slump areas and install additional cross drains. There are concerns about the dispersed recreation and off-road access that is taking place. There are several concerns about the last 2.6 mile segment of the South Fork Salmon road (4200000). The road is located in core habitat. It is a good candidate for relocation consideration. Relocation would help reduce negative riparian impacts; however, political issues would probably prevent any relocation. There are also some safety concerns about the width of the road. One suggestion was to raise the maintenance standard from a level 2 for high clearance vehicles to a level 3 to accommodate passenger cars. The minor repair recommendation is on the middle 3.4 miles, which is currently a maintenance level 3 to improve the ditches and culverts. There are also concerns about the road in core habitat. Finally, it is recommended to lower the maintenance standard on first two segments from a level 5 and 4, respectively, to a level 3 for both. That would make the maintenance level for entire road length a level 3 (accessible to passenger cars).

Table 20. Salmon Creek Watershed recommendations

Road name	FS Rd. #	Seg. length (mi)	Aquatic rating	Wildlife rating	Human use rating	Draft recom. mgmt.	Final recom. mgmt.
Salmon Meadows	3800000	0.3	H	H	H	Major repair	
South Fork Salmon	4200000	2.6	L	H	L	Major repair	
South Fork Salmon	4200000	3.4	M	H	H	Minor repair	
South Fork Salmon	4200000	0.1	M	H	H	Lower maint.	
South Fork Salmon	4200000	1.7	H	H	L	Lower maint.	

Northeast Okanogan (Tonasket) Watershed

The recommendation for all roads within this watershed is to leave them as is.

Southeast Okanogan (Fish, Tunk, Chewiliken) Watershed

The recommendation for all roads within this watershed is to leave them as is.

Similkameen Sub-Basin

Similkameen River Watershed

The recommendation of minor repairs or improvements is for the last 1.9 miles section. Consider installing additional culverts at the meadows and slump areas to help dissipate the water.

Table 21. Similkameen River Watershed recommendations

Road name	FS Rd. #	Seg. length (mi)	Aquatic rating	Wildlife rating	Human use rating	Draft recom. mgmt.	Final recommend. mgmt.
Meadows-Toats	3900000	1.9	M	H	L	Minor repair	

San Poil Sub-Basin

West Fork San Poil River Watershed

The suggestion for last eleven miles of Fir Creek is to lower the maintenance standard from a level 3 (accessible to passenger cars) to a level 2 (maintained for high clearance vehicles). All other roads analyzed in the watershed received “leave as is” recommendations.

Table 22. West Fork San Poil River Watershed recommendations

Road name	FS rd. #	Seg. length (mi)	Aquatic rating	Wildlife rating	Human use rating	Draft recom. mgmt.	Final recom. mgmt.
Fir Creek	3100000	11.1	L	H	M	Lower maint.	

West Fork Granite Creek Watershed

The recommendation for all roads within this watershed is to leave them as is.

Kettle Sub-Basin

Toroda Creek Watershed

The minor improvement for Marias Creek (3550000) and Nicholson Creek (3575000) is to stabilize the ditches and culverts and investigate for any potential flow problems. The recommendation for Marias Creek (3550000) and Cumberland Road (3240000) is to lower the maintenance standard from a level 3 (accessible to passenger cars) to a level 2 (maintained for high clearance vehicles). On the Cumberland Road the reduce maintenance standard above the trailhead (approximately 3 miles).

Table 23. Toroda Creek Watershed recommendations

Road name	FS rd. #	Seg. length (mi)	Aquatic rating	Wildlife rating	Human use rating	Draft recom. mgmt.	Final recom. mgmt.
Marias Creek	3550000	7.9	M	H	M	Minor repair /Lower maint.	
Nicholson Creek	3575000	5.7	M	M	H	Minor repair	
Cumberland	3240000	6.8	L	H	H	Lower maint.	

Myers Creek Watershed

The minor improvement for Nicholson Creek (3575000) is to stabilize the ditches and culverts and investigate for any potential flow problems. In addition, the recommendation for Lake Road (3400000) is to lower the maintenance standard from a level 3 (accessible to passenger cars) to a level 2 (maintained for high clearance vehicles).

Table 24. Myers Creek Watershed recommendations

Road name	FS rd. #	Seg. length (mi)	Aquatic rating	Wildlife rating	Human use rating	Draft recom. mgmt.	Final recom. mgmt.
Nicholson Creek	3575000	8.9	M	M	H	Minor repair	
Lake	3400000	1.7	L	M	L	Lower maint.	

Watershed Analysis Priority

During the analysis, the team reviewed the condition and uses of the watersheds as a whole to determine a priority recommendation for the completion of the watershed scale analyses. The team looked at the existing conditions and impacts within the watershed, types of use, anticipated future projects (such as dry site management or fuels planning), and the ability or opportunity to make changes. Table 25 shows the priorities.

Table 25. Watershed analysis priorities

Watershed	Human use rank	Wildlife rank	Aquatic rank	Composite rating
Tunk	L	L	L	6
West Fork San Poil	H	H	M	2
Bonaparte	H	H	M	2
Toroda	M	H	H	2
Antione	H	M	L	4
Siwash	M	M	L	5
Myers	M	M	M	4
Salmon	H	H	H	1
Similkameen	L	M	M	5
West Fork Granite	H	L	M	3
Tonasket	M	L	M	5

The Salmon Creek, Bonaparte, and Toroda Watersheds are high priority for further roads analysis due to a combination of high concerns for aquatic resources, and the high amount of human use activities. These watersheds provide important habitat for spring steelhead and wildlife.

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Appendices

Appendix A: Human Use Rating Criteria and Assessment

Appendix B: Aquatic Rating Criteria and Assessment

Appendix C: Wildlife Rating Criteria and Assessment

Appendix D: Recommended Management Actions

Appendix E: Public Input Summary

Appendix F: Definitions

Appendix A: Human Use Rating Criteria and Assessment

The objective of the human use portion of the roads analysis is to identify the importance of the road system to the human use activities in the particular sub-basin or watershed and to further identify the primary activities or combination of activities the road system is used for. Social values vary greatly among users. Further, users with similar interests will have greatly differing perceptions of what constitutes appropriate access.

It is not possible to satisfy every individual or group of individuals, nor is it possible to identify what people will desire tomorrow or into the next decade. It is possible to observe trends and at least make some qualitative estimates of what the future needs may be. However, we generally lack sufficient data to make accurate quantitative predictions. This exercise attempted to show the major categories of human use that exist today on a broad scale, but did not attempt to make quantitative predictions of future needs.

There is a great deal of overlap in social needs, so it is important to keep in mind the scale of population of users being considered; is it small scale/local community, medium scale/multiple community, large scale/regional, or very large scale/national importance? This consideration will help the decision maker determine whether the management of a particular road segment will have a direct or indirect effect on the user.

The human use factors are grouped into broad categories relating to the amount of flexibility the decision maker has, whether the value is expected to be of a local, regional or national scale, the current use pattern, and desired future condition.

In the "Questions Addressed" section for each factor an alphanumeric code that corresponds to Appendix 1 in the "Roads Analysis Handbook" is listed for each bullet item. This code is linked to an ecological consideration that has been formulated as a question. Each risk factor being evaluated addresses one or more of these questions. The appendix should be consulted for more information on the risk factor, including a list of potential indicators (tools) that may be considered to appropriately rate each factor.

Factor 1: Required By Law, Agreements and Permits

This factor includes access needs that are necessary to meet legal requirements such as: the Alaska National Interest Conservation Act (ANILCA), treaty requirements, easements, Memorandums of Agreement (MOAs), or permits of various kinds. Revised Statute 2477 (RS 2477) roads are included in this group. This factor includes the legal requirements, agreements, and commitments to other parties, including other federal, state, local agencies, Native American tribes, and private parties. Agreements can sometimes be modified, but usually they are of a long-term nature and can have significant influence on how a road is managed.

Questions Addressed

Legal basis (GT-1, 2, and 3)

Special Use Permits (SU-1)
Water Production (WP-1)

Rating

1. Identify roads and segments to which Public Laws such as ANILCA, RS 2477, or treaty requirements apply.
2. Identify roads or segments that have active permits, cost share agreements, easements or binding agreements.
3. Identify roads or segments that have special use permits involved.
4. Relative ranking is based on the above information:
   a. High (10) public law requires the road access be provided. These include roads that have Cost/Share agreements and long term easements in place.
   b. Medium (7) agreements or permits exist, but there are alternatives or options available to meet identified needs.
   c. Low (3) there are short-term commitments, which will expire or can be replaced with suitable alternatives.

Data Sources

Special Uses Data System (SUDS)
Forest Land Use Report (FLUR)
INFRA
District files of Agreements and Easements

Factor 2: Resource Management

This factor addresses the importance of the road system for the administration, management, or protection of forest resources. The forest manager has the flexibility to analyze options and select the one that provides the best balance of resource, social, and economic needs. At a sub-basin scale, definitions or classifications would be identified by broad groupings such as the percent of a watershed, the percent of a dry site, or an FMAZ zone.

Examples of sub-elements include:

Value of the road for implementation of desired future condition strategies, such as the Dry Site Strategy or Fire Management Plans
Administrative Use needs (AU-1)
Value of the road for Forest Service and cooperator to suppress wildland fires. Fire risk can be based on a combination of fire intensity mapping and knowledge of past fire occurrence. Fire intensity mapping is based on current vegetation, slope, aspect, elevation, and landform. This factor is considered highly important and is given a heavy numerical weighting. (PT-2)
Value of the road for management of insect, disease, or noxious weed infestations.
Does the road system address public health and safety (GT-4)?
Does the Forest have the necessary easements and rights on the road?

Rating

1. Identify roads which are needed for access to protect forest resources, facilities, or property.
2. Identify roads that are important for implementation of management strategies.
3. Roads covered within this analysis provide primary access to wildfires occurring on the district, either directly to the fire or to connecting roads, trails, and/or drop-off points. Roads can also serve as primary control lines, fuel breaks, or firefighter escape routes.
4. Vehicle travel on roads is a primary contributor to fugitive dust on the forest. Vehicle speed on any given road surface is the primary factor in determining the amount of dust or particulate matter introduced into the air shed. Of greatest concern is particulate matter less than 10 microns in diameter (PM10) and particulate matter less than 2.5 microns in diameter (PM2.5). Refer to individual watershed assessments for further discussion on the effects and importance of particulate matter.
5. Identify the roads that are important for research, monitoring, or inventory.
6. Relative ranking is based on the above information:
    a. High (10): Life or property is at-risk or a history of severe resource damage occurring in this area. Road is necessary for protection of life and property. Access to private or leased property and/or structures and access must be retained. A road ranked high if it is considered important for protection of resources and there are few or no alternative ways to access the area. Road serves developed recreation site or administrative sites. Road is part of a designated or informal, but well recognized, auto tour.
    b. Medium high (7): Access is necessary for resource protection for long term. Roads within the Low Fire Regime (naturally occurring as high frequency/low intensity) or roads that access pre-attack facilities. Road is needed for access to an active range allotment. Important for silvicultural treatments in dry and mesic sites. Road is important for treatment of existing noxious weed infestations in dry and mesic sites.
    c. Medium low (5): Roads within the Moderate Fire Regime with a high occurrence (also referred to as Dry Mesic) or roads that provide a mid-slope fire break.
    d. Low (3): Access is needed for implementation of management strategies for the near future. Roads within the Moderate Fire Regime with a moderate or low occurrence. Needed for silvicultural treatment in wet sites. Noxious weeds present in wet sites and road access will be needed for treatment. Paved or rock surface; not a significant source of fugitive dust and particulate matter. On a short-term basis, this may also refer to roads treated with dust suppressant such as water, lignin, or oil-based products.
    e. Low (2) Gravel: fugitive dust and particulate matter will largely depend on vehicle speed and road condition.
    f. Very Low (1): Fires within the High Fire Regime, (naturally occurring as low frequency and high intensity. Native surface; significant source of fugitive dust and particulate matter.
    g. Not needed (0): road does not serve a range allotment. Road is not necessary for fire protection. No noxious weed infestations present.

Data Sources

Analysis files for timber sales and other projects
Past harvest layer - 5 year action plan
Fire ignition layer in GIS
Urban interface mapping in GIS – natural vs. human caused fires
Infestation maps for insect and disease surveys
Past activity layer for weeds in GIS
Archeological probability maps (H/M/L)
Public scoping

Factor 3: Public Access and Level of Use

The factor includes both active and passive use by the public for all forms of outdoor recreation where people are actually present on the Forest. It also includes elements that do not necessarily involve active participation, but knowing these elements are in place or available has significant value. The forest manager will need to involve large numbers and diverse groups in any decisions associated with this factor.

The most common public needs are generally associated with some form of recreation or leisure activity. Because this factor by definition involves actual access and use of the road, it is most important on a local and regional scale. There would be a lesser degree of importance on a national scale for stakeholders who come from other regions or states and use the Forest.

The Recreation Opportunity Spectrum (ROS) classification is used in the Land and Resource Management Plan (Forest Plan) to arrange the possible experience opportunities across a spectrum. ROS land delineations identify a variety of recreation experiences in six classes along a continuum from primitive to modern-urban. Each class is defined in terms of the degree to which it satisfies certain recreation needs based on area size, the extent to which the natural environment has been modified, the type and development of facilities available and the degree of outdoor skills needed to enjoy the area. The seven ROS classes are: Primitive, semi-primitive non-motorized, semi-primitive motorized, roadbed natural, and roadbed modified, rural, and urban.

Question Addressed

Unique physical or biological characteristics (PV-1)
Unique cultural or spiritual value (PV-2)
People's perceived needs and values for the road (SI-1)
Value to local community social and economic health (SI-6)
Effect on people's sense of place (SI-10)
Unloaded recreation values (UR-1 through 5)
Roadbed recreation values (PR-1 through 5)
Access to developed sites
Access to undeveloped sites
Consistency with Recreation Opportunity Spectrum (ROS) classifications in the Forest Plan

Rating

1. Identify road or segments that serve developed sites, popular dispersed sites, or that are popular for recreation activities.
2. Identify the predominant ROS classification served by the road or segment.
3. Identify areas where the predominant recreation use is enhanced by lower road density. Leaning toward more primitive recreation activities.
4. Identify roads or segments that stakeholders have an expressed interest in keeping open for general Forest travel or exploring.
5. Identify roads or segments that stakeholders have expressed interest in reducing to a lower standard, converting to trail, or obliterating.
6. Relative rankings are based on above elements:
    a. High (10) road is needed to access developed facilities and activities toward the developed end of the ROS scale.
    b. Medium (6) activities are semi-primitive motorized or semi-primitive non-motorized portion of the ROS scale. Low standard roads are preferred and/or low density is preferred to enhance the recreation activity.
    c. Low (3) semi-primitive non-motorized or primitive ROS classification. Activities in this area are characterized as more challenging and more secluded. The degree of skill needed to participate is greater.

Data Sources

Scoping for specific projects
Frontline contacts
Comment boxes and comment cards
Personal contacts
Travel cost surveys

Factor 4: Economics

This factor includes the relationship of the road system to local and regional economic values. The stakeholders in this group would be individuals and businesses that receive direct or indirect economic benefit from the Forest. Though there are direct economic benefits from commodity production, such as mining, grazing, and wood products manufacturing, economic benefits are also derived from providing services through contracts or permits. Permitted uses could include such things as mushroom gathering, posts, poles, floral greenery, boughs, Christmas trees, and other miscellaneous forest products, as well as the services provided along the route either privately or by permit. The indirect benefits from people visiting the forest for business or pleasure are also important to communities at a local and regional scale. Economic values are market-based, involving supply and demand.

The Interior Columbia Basin Ecosystem Management Project scientists concluded, "…that recreation use generates far more jobs than other uses of Forest Service- and BLM administered lands. Recreation provided by these public lands contributed about 15 percent of total jobs, area-wide" (USDA 1996). The geographic scale for this factor is primarily local and regional.

Questions Addressed

Recreation and tourism (EC-3)
Commodity production (TM-3), MM-1), (RM-1)

Rating

1. Identify roads or segments that access developed sites, fee sites, concession, or commercial permit operations, and that are necessary to directly support these services.
2. Identify roads or segments that are important for activities, which provide revenue to local communities and businesses.
3. Relative rankings are based on above:
   a. High (10): Access is essential for commodity production or area business. Area served by road is in Matrix land allocation in Forest Plan and is important for timber production.
   b. Medium (6): Tourism or local businesses benefit indirectly; other access points or forms of access could replace this road and businesses would not be severely affected. Road access is desirable to draw users into the communities. Area is allocated as Managed Late Success ional Reserve (MLSR) and will have some timber management activities. Includes areas that are in Matrix and are important for firewood gathering. Provides access to a range allotment.
   c. Low (3): Economic dependency on access is either low or short term. Land allocation is Late Success ional Reserve (LSR) and will have limited timber treatment. Area is used for special forest products including products, such as boughs, cones, bear grass, and transplants. Area is allocated MLSA and receives some use for firewood gathering.
   d. Very Low (1): Land is administratively withdrawn or in a LSR and will have only incidental timber treatment, and will occasionally produce some firewood as a byproduct of another activity.

Data Sources

Sales tax
Costs for police, ambulance, and fire services
SCORP report
Permits

Appendix A Works Cited

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Table A-1. Human uses, Tonasket Ranger District

Road segment #	FS rd #	Seg. length	Access required by law/agree	Resource mgmt.	ROS class	Level of use	Economics	Human use total	Human use rating
1	3000000	1.8	9	10		10	10	39	H
2	3000000	14.1	9	10		10	10	39	H
3	3010000	10	9	10		10	10	39	H
4	3010000	2.4	6	10		7	10	33	H
5	3015000	6.6	9	10		3	10	32	H
6	3100000	2.6	6	3		7	10	26	M
7	3100000	4.8	9	10		7	10	36	H
8	3100000	11.1	9	10		3	7	29	M
9	3120000	8.3	9	10		7	10	36	H
10	3125000	4.8	9	10		7	10	36	H
11	3200000	1.8	9	10		10	3	32	H
12	3200000	1.8						0	
13	3200000	3.7	9	10		10	3	32	H
14	3230000	4.3	9	10		10	10	39	
15	3230000	0.7	9	10		7	10	36	H
16	3230000	4.6	9	10		3	10	32	H
17	3230000	6.1	0	10		3	10	23	M
18	3235000	1.6	9	10		7	10	36	H
19	3235000	3.4	0	10		7	10	27	M
20	3240000	0.8	3	7		10	10	30	M
21	3240000	6.8	3	10		10	10	33	H
22	3300000	2.9	9	10		10	10	39	H
23	3300000	2.4	9	10		10	10	39	H

Road segment #	FS rd #	Seg. length	Access required by law/agree	Resource mgmt.	ROS class	Level of use	Economics	Human use total	Human use rating
24	3300000	5.2	0	10		10	0	20	L
25	3300000	4.5	0	10		10	10	30	M
26	3400000	1.7	0	10		3	7	20	L
27	3525000	6.4	9	10		10	10	39	H
28	3525000	4.8	9	10		10	10	39	H
29	3550000	7.9	3	10		3	10	26	M
30	3575000	8.9	9	10		7	10	36	H
31	3575000	5.7	9	10		7	10	36	H
32	3700000	5.2	9	10		7	0	26	M
33	3700000	9.5	9	10		10	0	29	M
34	3800000	0.3	3	7		10	10	30	M
35	3800000	6.5	9	10		10	10	39	H
36	3810000	3.2	9	10		3	10	32	H
37	3900000	19.1	9	10		10	3	32	H
38	3900000	1.9	3	3		10	3	19	L
39	4200000	2.6	0	3		3	7	13	L
40	4200000	1.3	9	10		7	10	36	H
41	4200000	1.7	3	3		3	10	19	L
42	4200000	3.4	3	3		3	10	19	L

Appendix B

Aquatic Rating Criteria and Assessment

The objective of the aquatic assessment is to characterize how the transportation system may be influencing watershed processes and aquatic habitat at the sub-basin and site scale. The assessment at the sub-basin and watershed scale is basically the same, the primary difference being the scale of road segment to be analyzed. The basic units of assessment at the sub-basin scale are the watersheds within the sub-basin and road segments of arterial and collector roads within the watersheds. The sub-basin scale analysis will help prioritize watersheds for further analysis based on aquatic resources and potential restoration needs, identify issues within watersheds, establish context for the watershed or project scale analysis and identify potential management of the arterials and collectors. Analysis of local roads at the watershed or project level is basically the same while the segment length may be different. Ratings for the sub-basin scale analysis include overall watershed condition ratings and segment specific ratings. It is hoped that after the sub-basin scale assessment has been completed, only information specific to the smaller segments will be needed as part of project analysis. The watershed condition ratings are based upon the watershed BAs with further information provided by completed watershed analysis and existing GIS layers. The watershed condition ratings establish a context for the road segment ratings. The segment ratings are based upon stream survey data, road logs, culvert surveys, and local knowledge.

Development of the Aquatic Impact, At-Risk Criteria

Aquatic criteria were developed to capture key processes associated with roads as they link to aquatic environments.

Criteria include:

1. Geologic hazard
2. Road-related sediment
3. Floodplain off-channel habitat riparian reserve function
4. Flow effects
5. At-risk fish populations and wetlands.
6. Wetlands and wet meadows

In the “Questions Addressed” section for each factor an alphanumeric code that corresponds to Appendix 1 in the “Roads Analysis Handbook” is listed for each bullet item (USDA FS 1999). This code is linked to an ecological consideration that has been formulated as a question. Each risk factor being evaluated addresses one or more of these questions. The appendix should be consulted for more information on the risk factor, including a list of potential indicators (tools) that may be considered to appropriately rate each factor. The term “at-risk fish” in this document refers to fish listed as threatened or endangered under the Endangered Species Act.

Criterion 1: Geologic Hazard

This criterion was developed to incorporate the natural risk of mass wasting as an effect on roads

or potential for roads to accelerate mass movement events. Three forms of mass movement were identified: debris slides (shallow rapid landslides); earth slumps (fairly deep land slides); and deep-seated landslides. On the Okanogan and Wenatchee National Forests, debris slides are often associated with coarse textured sediment, earth slump medium textured sediment, and deep seated fine and very fine sediment.

The interpretation of mass wasting was taken from the Landtype Associations of North Central Washington's preliminary report (USDA FS 2000). These interpretations were based on observations of landslide features, Landtype Association site features, and literature references. The interpretations are based upon geomorphic mapping, bedrock weathering properties, geologic structural features, slope gradient, drainage characteristics and patterns, and regolith features.

Geologic Hazard was considered to be a highly important factor relating to aquatic conditions. The numerical weighting however was restricted, weighted heavily toward the high and very high hazards. Each road segment will receive a rating for Geologic Hazard.

Questions Addressed

Mass wasting (AQ –3)

Rating

1. Low risk = 0
2. Moderate risk = 2
3. High risk = 6
4. Very high risk = 9

Criterion 2: Road-Related Fine Sediment

Surface erosion occurs on forest roads due to erosion of the road surface, cut and fill slopes, and accelerated mass failures. Erosion of the road is sensitive to road design, road maintenance and geologic hazard. Road surface, design and maintenance of drainage structures can also influence the amount of road surface erosion. Insufficient drainage structures, culverts, including ditch-relief culverts, can also be sources of sediment.

Roads crossing areas of high geologic hazard or with unstable fill slopes may contribute to accelerated mass wasting initiated by the failure of the fill slope. Culverts at stream crossings can be a sediment source if the culvert is under-sized and the hydraulic capacity is exceeded or the culvert inlet is plugged causing stream flow to overtop the road. Large amounts of sediment or mass wasting can also be generated if the plugged culvert results in failure of the crossing resulting in a debris flow, when the culvert is overrun resulting in the stream flowing down the road, eroding the surface and fill. Ditch relief culverts that erode fill material directly into streams is another sediment source.

Questions Addressed

Generated Surface Erosion (AQ – 2)
Mass Wasting (AQ – 3)

Stream crossing influence local stream channels and water quality (AQ – 4)

Ratings

1. Fine Sediment -Watershed condition
   a. 1 = Watershed is rated as Functioning Appropriately for fine sediment; transportation system consistent with the Aquatic Conservation Strategy (ACS).
   b. 3 = Watershed is rated as At risk for fine sediment; road system is a contributor to fine sediment but is not felt to be a major contributor and road system is generally consistent with ACS.
   c. 6 = Watershed is rated as at risk for fine sediment; roads are felt to be a major source of fine sediment and road system is inconsistent with ACS.

   10 = Watershed is rated as Functioning at Unacceptable Risk for fine sediment; road system is felt to be a major contributor of fine sediment, and road system is inconsistent with the ACS.

Fine Sediment – Segment

   a. 1 = Road segments with a paved surface, crossings are bridged or sufficient to pass the 100-year flood and associated debris. Cut and fill slopes are vegetated and not eroding. Crossings are not impacting channel morphology downstream.
   b. 3 = Road segment is native or gravel surfaced but no visible erosion, ditch relief culverts are not causing erosion of fill into streams, crossings are perpendicular to the stream and sufficient to pass the 100-year flood, or designed so that if they do fail only the prism at the crossing fails. Crossings are not impacting channel morphology downstream or causing downstream bank erosion. There is no evidence of accelerated mass wasting due to the road segment.
   c. 5 = Road segments not meeting the above criteria to some degree but have potential impact to at-risk fish habitat that appears to be minor due to the amount of erosion, potential sediment delivery if a crossing failure or fill slope failure were to occur, changes to channel morphology due to a crossing is confined to the site or does not alter the channel type.
   d. 10 = Road segments with high potential impact to at-risk fish habitat. Road surface and/or fill slopes exhibit either erosion into streams, visible ditch erosion, or cut slope erosion into ditches. Sediment directly enters fish-bearing stream from ditch, fill slopes begin to fail, and evidence of accelerated mass wasting due to the sediment becomes prevalent. Crossings with high potential for failure where failure of the prism will result in a large amount of sediment into at-risk fish habitat or the culvert is over-topped it is highly likely the stream will travel down the road and deliver sediment to at-risk fish habitat, crossing are altering stream channel type downstream and/or causing downstream bank erosion

Criterion 3: Flood Plain Function, Off-Channel Habitat and Riparian Reserves

This criterion addresses how the road segment has altered the function of a stream's floodplain and/or off-channel habitat. Flood plains are important regulators of stream flow and water quality. They absorb over-bank floodwaters, allowing water to soak through vegetation/organic mat, and into the ground. Here water can be stored and released more slowly into streams. In doing so, functioning floodplains can provide more water in late summer and reduce peak floods in winter and spring.

Roads can affect flood plains by:

- Limiting the frequency of over-bank flows and concentrates greater volumes of water within stream banks
- Interfering with the ability of the stream to migrate across its flood plain
- Preventing slope runoff from recharging flood plain aquifers
- Intercepting runoff and floodwaters thereby eroding and degrading water quality
- Indirectly degrading flood plain function by encouraging off-road motorized access from roads onto flood plains.

Indicators of direct and indirect flood plain or riparian reserve degradation include:

- Soil compaction
- Noxious weed introduction
- Evidence of soil erosion or mass wasting of road fill during peak runoff
- Water quality changes
- Artificial confinement of streams
- Stream bank erosion
- Interruption of hill slope delivery of water onto floodplain
- Loss of downed or standing woody debris that is both an energy dissipater and a habitat component.

Similar impact occurs if roads are within or provide vehicle access to the portion of a riparian reserve that affects aquatic habitat. Effects include loss of bank vegetation with associated loss in cover and accelerated bank erosion, reduction in large wood from the channel or potential large wood due to wood cutting or hazard tree removal, soil compaction, and accelerated surface erosion.

Off-road access provided by roads onto flood plains or riparian reserves is influenced by factors that include:

- Proximity of road to flood plain
- Slope of ground leading from road onto floodplain

Desirability of flood plain determined by its width and demands for dispersed use. With more alteration the likelihood increases that stream systems will not function properly and those road segments within the flood plain will be at higher risk of damage.

Off-channel habitats provide important rearing habitat and refuge habitat during high flows. Roads in flood plain may isolate these off-channel areas so they are no longer accessible to fish or completely fill them. A road system may not isolate or fill an off-channel area but, by providing access to vehicles, result in loss of vegetation, bank stability, large wood input, cover,

and a loss of overall habitat quality.

Questions Addressed

Changes in physical channel dynamics (AQ – 9)
Affects to shading, litterfall and riparian plant communities (AQ – 11)
Affects of fishing, poaching, and direct habitat loss for at-risk aquatic species (AQ – 12)

Rating

1. Flood plain function – Watershed condition:
   a. 1 = Main arterials and collectors are not located in valley bottoms or if located in valley bottom are neither constricting the channels nor providing dispersed recreation access which is diminishing flood plain function or off-channel habitat quality. Flood plain connectivity, off-channel habitat and riparian reserves are rated as Functioning Appropriately.
   b. 3 = Some arterial and collector roads are located in the valley bottoms and are causing minor stream confinement. Dispersed recreation access is not resulting in adverse impact to the flood plain, riparian function that affects aquatic habitat, or off-channel habitat. Flood plain connectivity, off-channel habitat and riparian reserves are rated as Functioning Appropriately. If riparian reserves are rated as Functioning At-Risk the rating is not primarily due to the road system or dispersed recreation. While riparian reserves may be at risk, off channel habitat and flood plains are functioning appropriately.
   c. 9 = Main arterial and/or collectors are constricting streams so that floodplain connectivity and/or off-channel habitat are rated At Risk and/or Riparian Conservation Areas are rated as At Risk due to dispersed recreation, or if there is concern over potential dispersed use, even if Riparian Conservation Areas are currently Functioning Appropriately. Dispersed use is not consistent with Aquatic Conservation Strategy (ACS) or appears to be moving towards being inconsistent with ACS.
   d. 10 = Flood plain connectivity or off-channel habitat and/or Riparian Conservation Areas are considered to be Functioning At Unacceptable Risk due to road system and or dispersed recreation. Generally dispersed recreation would currently be inconsistent with ACS.
2. Flood plain function – Road segment:
   a. 1 = Road segment is not located in valley bottom or is located on toe slope in confined valley bottom outside the 100-year floodplain and not interfering with floodplain function.
   b. 6 = Road segment located on moderately confined valley or unconfined bottoms with localized areas of road encroachment on stream channel. Road location may be providing motorized off-road access onto flood plain or within riparian reserve such that flood plain or riparian habitat conditions which affect aquatic habitat showing signs of degrading in localized areas (see indicators above).
   c. 9 = Road segment located on unconfined valley bottom which frequently or continuously restricts channel migration, off-channel habitat and riparian habitat conditions affecting vegetation, altering movement of water, accelerating erosion

processes, interfering with recruitment of large woody debris (LWD), and/or is providing access for motorized off-road dispersed use within the flood plain or riparian reserve to the point riparian habitat conditions affecting riparian habitat are being degraded.

Criterion 4: Flow effects

Criterion 4 addresses if road segments a) intercept surface runoff and near surface ground water, along cut slopes and ditch lines, converting subsurface flows to surface flows, and b) increase delivery efficiency of these flows by diverting them directly to streams. Where these combined flows are continuous between roads and stream systems, there is hydrologic connectivity. Hydrologic connectivity is the condition under which a road segment, during runoff, has a continuous surface flow between any part of the road prism and a natural stream channel. Water moves from hill slopes to valley bottom by surface and subsurface paths. Roads affect flow when they cut across hill slopes and/or require fill material through depressions that interrupt these natural paths. Road-cut slopes or ditches intercept surface runoff and groundwater, accelerating their movement toward stream crossings. This action frequently increases soil erosion risks and routing efficiencies, which deliver road-derived sediments and contaminants to streams and can alter peak flows and channel characteristics downstream. Precipitation runoff mechanisms, including rain-on-snow, spring snowmelt and convectional storms should be considered when evaluating a road segment's hydrologic connectivity. Indicators of these effects include water interception on road surfaces and ditch lines, absences of ditch line relief culverts or cross drains, or interruption and detention of flows by road fill.

Questions Addressed

Affects to surface and subsurface hydrology (AQ – 1)
Affects to water quality, quantity, and hydrologic connectivity (AQ – 6)

Rating

1. Flow affects – Watershed condition:
   a. 1 = Roads are not greatly impacting watershed function. Road Density and Location, changes in peak/base flows are Functioning Appropriately.
   b. 3 = Road Density and Location are Functioning At Risk but Change in Peak/Base Flows is Functioning Appropriately
   c. 6 = Road Density and Location are Functioning At Risk or Unacceptable Risk and Change in Peak/Base Flows is Functioning At Risk
   d. 9 = Road Density and Location is Functioning At Risk or Unacceptable Risk and Change in Peak/Base flows is Functioning At Unacceptable Risk
2. Flow Effects – Segment:
   a. 0 = Road segment is not intercepting concentrating runoff or groundwater in ditch lines. Runoff is cross-drained through a vegetative filter prior to reaching stream channels. Natural flow paths are maintained uninterrupted.
   b. 3 = Road segment is occasionally intercepting runoff, especially during peak events, but generally not groundwater. Delivery efficiencies are low due to combination of landform slope and weakly developed stream networks. Some additional ditch relief

is necessary for routing surface runoff through vegetative filter. Downstream stream reaches may be susceptible to damage from increase peak flows.

c. 9 = Road segment frequently intercepting both surface runoff and/or groundwater in sufficient volumes to influence flow downstream and delivering waters directly to streams. Landform slopes are steep and drainage densities high, providing increased delivery efficiency to stream channels. Downstream channels are unstable and susceptible to damage from increased peak flows. Road prisms may be interrupting and detaining water preventing it from recharging floodplain aquifers. Road has high hydrologic connectivity to the stream system.

Criterion 5: At-Risk Fish Populations

This criterion addresses the relative importance of a sub-watershed to the conservation and recovery of at-risk fish and to help weigh the potential for adverse impact to at-risk fish or their habitat. Roads not only have the potential to impact aquatic habitat; they can increase the potential for poaching or introduction of exotic species.

Questions Addressed

Downstream beneficial uses of water and demands (AQ – 7)
Affects to migration and movement of aquatic organisms (AQ – 10)
Affects to fishing, poaching and direct habitat loss for at-risk aquatic species (AQ – 12)
Affects to areas of exceptionally high aquatic diversity or rare or unique species (AQ – 14)

Rating

1. At-risk fish populations:
   These criteria address whether fish listed for protection under the Endangered Species Act are present in the watershed and the relative importance to recovery within the sub-basin.
   a. 0 = No at-risk fish present in the sub-basin or watershed
   b. 1 = At-risk fish are present but there are no significant sub-watersheds.
   c. 3 = At-risk fish are present but there are no significant sub-watersheds because populations are depressed preventing identification of significant sub-watersheds or significant sub-watersheds have been identified but populations are very low and habitat is fragmented or severely degraded.
   d. 6 = At-risk populations are present with significant sub-watersheds for one or multiple species; habitat connectivity exists within the watershed. Habitat conditions are such that with relatively low investment in restoration the watershed could be a refugia from a habitat standpoint or management emphasis on restoration for other resources can be coordinated with aquatic/watershed restoration (i.e., “dry site or 303d.”)
   e. 9 = Multiple significant sub-watersheds exist for multiple species or watershed represents a refugia within the sub-basin for one or more species
2. At-risk fish populations – road segment (AQ - 7, 10, 12, 14)
   a. 1 = Road segment with the following set of conditions: road segments located in 6th

field watershed with no listed fish species; stream crossings are not migration barriers (any life stage) for other fish species.

b. 3 = Road segment is in a sub-watershed with at-risk fish or tributary to a watershed with at-risk fish, but neither the sub-watershed is within nor the sub-watershed downstream is a significant sub-watershed for an at-risk species. Stream crossings are not barriers to at-risk fish, but may be barriers to other species.
c. 5 = Road segment is in a sub-watershed with at-risk fish or tributary to a watershed with at-risk fish, but neither the sub-watershed is within nor the sub-watershed downstream is a significant sub-watershed for an at-risk species, but one or more crossings are present that present a barrier to at-risk fish at some life stage.
d. 6 = Road segment is in a significant sub-watershed for an at-risk species or is a tributary to significant sub-watershed, no road crossings are barriers to any life stage of an at-risk species, poaching is not a major concern.
e. 8 = Road segment is in a significant sub-watershed for an at-risk species or is tributary to a significant sub-watershed, no road crossings are barriers to any life stage of an at-risk species, but poaching due to access from the road segment is a concern though not necessarily documented.
f. 10 = Road segment is in a significant sub-watershed for an at-risk species or is tributary to a significant sub-watershed. The road segment is or has potential, based upon the previous factors, to have serious adverse impact to at-risk fish habitat; and/or there are road crossing barriers to some life stage of at-risk species and/or there is known poaching of at-risk fish occurring.

Criterion 6: Wetlands and Wet Meadows

These criteria address whether wetlands are present along road systems and do road segments interfere with wetland condition and function, including ground water movement or wetland vegetation.

A road segment's influence on the condition and function of adjacent wetlands can be a result of:

a direct impact such as, a road location relative to the wetland.
an indirect impact related to the roads effect on the wetland supporting hydrology.
a change in vegetative community and soil characteristics.

The most notable effects include

converting productive wetlands to compacted road surfaces.
providing motorized off-road access into these areas.
constraining and diverting both surface and subsurface flows that support the water table.
intercepting runoff which can accelerate erosion and lower water tables.
increase sediment loading and delivery of toxic pollutants.
conversions in plant species composition by introducing noxious weeds.
reduce base flows and increase peak flow and flood frequencies and degrade water quality.

Of these effects, those that affect the area's ability to receive, store, and move water will likely have the greatest impact on the wetland's condition and function.

Questions Addressed

Affects on wetlands

Ratings

1. Listed below is a summary of hazard rating for road segments:
   a. 0 = Road segment is either not near or adjacent to wetlands/wet meadows, or road design characteristics are providing for the uninterrupted movement of surface and groundwater necessary to support the wetland's vegetation and soil characteristics.
   b. 3 = Road segment is adjacent to or crosses small localized wetlands or wet meadows. Road design characteristics, particularly crossings of surface and near surface water paths are limiting the available water necessary to inundate and saturate the landform and support the wetland's vegetation and soil characteristics. Initiation of wetland degradation, including noxious weed establishment, increased sediment loading, and decreased area of saturation, is occurring.
   c. 6 = Road segment is adjacent to or crosses landscape scale wetlands or wet meadows. The road's location and design have displaced or degraded the wetland's size and function. Runoff is being delivered directly to the wetland, increasing sediment and contaminant loadings. Crossings of surface and near surface water paths have severely limited the volume, timing and distribution of water necessary to saturate the landform and support the wetland's vegetation and soil characteristics. Road segment may be providing motorized off-road vehicles access into the area, further contributing to its degradation.

Table B-1. Aquatic impact, at risk, Tonasket Ranger District

Road seg. #	FS rd #	Seg. length	Geologic hazard	Rd-related fine sediment	Floodplain function	Flow effects	At-risk fish pops	Wetlands & meadows	Aquatic total	Aquatic rating
1	3000000	1.8							0	L
2	3000000	14.1							0	L
3	3010000	10							0	L
4	3010000	2.4							0	L
5	3015000	6.6							0	L
6	3100000	2.6							0	L
7	3100000	4.8							0	L
8	3100000	11.1							0	L
9	3120000	8.3							0	L
10	3125000	4.8							0	L
~~11~~	~~3125000~~	~~1.8~~	-	-	-	-	-	-	~~0~~	-
12	3200000	1.8							0	L
13	3200000	3.7							0	M
14	3230000	4.3							0	L
15	3230000	0.7							0	L
16	3230000	4.6							0	L
17	3230000	6.1							0	L
18	3235000	1.6							0	L
19	3235000	3.4							0	L
20	3240000	0.8							0	L
21	3240000	6.8							0	L
22	3300000	2.9							0	L
23	3300000	2.4							0	L
24	3300000	5.2							0	L
25	3300000	4.5							0	L
26	3400000	1.7							0	L

Road seg. #	FS rd #	Seg. length	Geologic hazard	Rd-related fine sediment	Floodplain function	Flow effects	At-risk fish pops	Wetlands & meadows	Aquatic total	Aquatic rating
27	3525000	6.4							0	L
28	3525000	4.8							0	L
29	3550000	7.9							0	M
30	3575000	8.9							0	M
31	3575000	5.7							0	M
32	3700000	5.2							0	L
33	3700000	9.5							0	L
34	3800000	0.3							0	L
35	3800000	6.4							0	H
36	3810000	3.2							0	M
37	3900000	19.1							0	L
38	3900000	1.9							0	M
39	4200000	2.6							0	L
40	4200000	0.1							0	M
41	4200000	1.7							0	H
42	4200000	3.4							0	M

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Appendix C

Wildlife Rating Criteria

The objective of this portion of the roads analysis is to characterize the wildlife/road interactions that occur within each watershed within a sub-basin. The sub-basin analysis will identify major arterial and collector roads for management, prioritize watersheds for further analysis at the watershed scale based upon potential restoration needs for wildlife habitats, identify issues within watersheds, and establish the context for watershed scale roads analysis.

The analyses described below can be used to address wide-ranging carnivores, late-successional associated species, riparian-dependent species, ungulates, and unique habitats. Table C-1 provides an approach to rank watersheds based on the wildlife issues within each watershed and the potential to provide benefits to the restoration of wildlife habitats. Table C-2 provides a summary of road-associated factors that affect wildlife habitats or populations (Wisdom et al. 1999). The analyses address the terrestrial wildlife (TW) roads analysis questions, TW-1, TW-2, TW-3, TW-4, and ecosystem functions (EF) question EF-2 identified in Appendix 1 of "Roads Analysis: Informing Decisions about Managing the National Forest Transportation System" (Roads Analysis Handbook) (USDA FS 1999). The analyses described here is an adaptation of the TW questions to better address the issues and conditions on the Okanogan and Wenatchee National Forests.

In the Questions Addressed section the alphanumeric codes listed above correspond to the section in Appendix 1 of the "Roads Analysis Handbook." This code is linked to an ecological consideration, which has been formulated as a question. Each risk factor being evaluated is addressing one or more of these questions. The appendix should be consulted for more information on the risk factor, including a list of potential indicators (tools) that may be considered to appropriately rate each factor.

Definitions

Impassable road – Not reasonably or prudently passable by conventional four-wheeled passenger vehicles, motorcycles, or all-terrain vehicles.

Open road – Open to motorized use during any portion of the season of concern for the particular species being addressed. If information is not available concerning the effectiveness of a gate or berm it may be best to assume it is open.

Restricted road – Legally restricted, typically with gates or berms, and for which information is available showing that use does not exceed 14 days.

Table C-1. Relative ranking scheme to determine the priority of watersheds for watershed scale analysis within each sub-basin for each species group or habitat

Species group/Habitat	High	Moderate	Low
Wide-ranging carnivores	9	5	1
Late-successional species	10	6	2
Riparian dependent	10	6	2
Ungulates	9	5	1
Unique habitats	10	6	2

Table C-2. Road-associated factors that negatively affect habitat or populations of wildlife species (based on Wisdom et al. 1999) and the wildlife species group for which effects of the road-associated factor has been documented

Road-associated factor	Effect of the factor	Wildlife group affected
Hunting	Non-sustainable or non-desired legal harvest by hunting facilitated by road access	Wide-ranging carnivores; Ungulates
Poaching	Increased illegal take of animals, as facilitated by roads	Wide-ranging carnivores; Ungulates
Collisions	Death or injury resulting from a motorized vehicle running over or hitting an animal	Wide-ranging carnivores; Late-successional; Riparian dependent; Ungulates; Unique Habitats
Chronic negative human interactions	Increased mortality of animals (e.g. euthanasia or shooting) due to increased contact with humans, as facilitated by road access	Wide-ranging carnivores
Movement barrier	Interference with dispersal or other movements as posed by a road itself or by human activities on or near a road or road network	Wide-ranging carnivores; Late-successional; Riparian dependent; Ungulates; Unique Habitats
Displacement or avoidance	Spatial shifts in populations or individual animals away from a road or road network in relation to human activities on or near a road or road network	Wide-ranging carnivores Late-successional Riparian dependent Ungulates Unique Habitats
Habitat loss and fragmentation	Loss and resulting fragmentation of habitat due to the establishment of roads, road networks, and associated human activities	Wide-ranging carnivores; Late-successional; Riparian dependent; Ungulates; Unique Habitats

Criterion 1: Wide-Ranging Carnivores

This group of species includes the grizzly bear (threatened), gray wolf (endangered), wolverine, and Canada lynx (threatened). Several studies have documented the effects of road-associated factors on carnivores and have included hunting, poaching, collisions, chronic negative human interactions, movement barriers, displacement/avoidance, habitat loss and fragmentation (Thiel 1985, McLellan and Shackleton 1988, Mech et al. 1988, Kasworm and Manley 1989, Mace et al. 1996, Singleton and Lehmkuhl 1998). Several questions remained unanswered about the relationship between lynx and roads. McKelvey et al. (1999) found no evidence that narrow, forest roads at relatively low road densities affected habitat use by lynx. However, their analyses did not address potential indirect effects of roads on habitat quality for lynx. There is some additional speculation that roads used during the winter for snowmobile routes may increase the interactions between lynx and other competitors such as bobcat and coyotes (Buskirk et al. 1999). Therefore, to err on the conservative side, road-associated factors and lynx are considered in this analysis.

Questions Addressed

Direct effects on terrestrial species habitat (TW-1)
Affects to habitat by facilitating human activities (TW-2)
Affect to legal and illegal human activities, i.e. trapping, hunting, poaching (TW-3)

Rating

1. Analysis area: The watershed (5^{th} Field) within the sub-basin (4^{th} Field).
2. Follow the process described in the Interagency Grizzly Bear Committee Task Force Report (1998) to develop maps of core areas and road densities within each watershed in the sub-basin.
3. Identify issues and priorities for further watershed level roads analysis and for habitat restoration of major arterial and collector roads in each watershed within the sub-basin based on the following:
   a. Amount and location of core areas in the watershed.
   b. Road density within the watershed, defined as: high = >2mi/mi^2, moderate = 1-2mi/mi^2, and low = <1 mi/mi^2.
   c. Proportion of the watershed affected by winter use of road in a Lynx Analysis Unit.
4. Relative Ranking. Based on the above information rank the watershed and the major arterial and collector roads as follows:
   a. Low (1) – low potential to improve conditions for the target species.
   b. Moderate (5) – moderate potential to improve conditions for the target species.
   c. High (9) – high potential to improve conditions for the target species.

Criterion 2: Late-Successional Associated Species

Over 100 wildlife species identified on the Wenatchee National Forest were associated with some type of late-successional forest type (USDA FS 1997). A review of the available literature on these species showed that approximately one-third could be affected by roads or road-related activities (USDA FS 1997). Road-associated factors that could affect these species include

collisions, movement barriers, displacement/avoidance, habitat loss and fragmentation (USDA FS 1997, Singleton and Lehmkuhl 1998, Wisdom et al. 1999).

Questions Addressed

Direct effects on terrestrial species habitat (TW-1)
Affects to habitat by facilitating human activities (TW-2)
Affect to legal and illegal human activities, i.e., trapping, hunting, poaching (TW-3)

Ratings

1. Analysis area: The watersheds within the sub-basin.
2. Follow the process outlined in the "Wenatchee National Forest Late-Successional Reserve Assessment" (USDA FS 1997, p. 107). Refer to the LSRA to determine the current condition of security habitat within the LSR.
3. Identify the issues and priorities for further analysis, and major arterial and collector roads restoration opportunities for each watershed within the sub-basin based on the following:
   a. Juxtaposition of late-successional habitat to road or road segment.
   b. Road density (high = >2mi/mi^2, moderate = 1-2mi/mi^2, and low = <1 mi/mi^2.) and security habitat conditions within the LSR.
   c. Potential of the road to enhance security habitat within the LSR.
4. Relative ranking. Based on the above information rank the watershed and the major arterial and collector roads as follows:
   a. Low (2) – Low potential to improve the security habitat and habitat effectiveness in the LSR.
   b. Moderate (6) – Moderate potential to improve the security habitat and habitat effectiveness in the LSR.
   c. High (10) – High potential to improve the security habitat and habitat effectiveness in the LSR.
   d. If none of the watershed is within an LSR, score as 0.

Criterion 3: Riparian-Dependent Species

This group of wildlife species includes about 285 vertebrate species that are either directly dependent on riparian habitat or use them more than other habitats (Thomas et al. 1979). Road-associated factors that could affect these species include collisions, movement barriers, displacement/avoidance, habitat loss and fragmentation (USDA FS 1997, Singleton and Lehmkuhl 1998, Maxwell and Hokit 1999, Wisdom et al. 1999).

Questions Addressed

Affects of unique communities or special features (TW – 4)

Rating

1. The analysis area: The watersheds within the sub-basin.
2. Determine the area within riparian reserves and density of roads within riparian reserves.

3. Identify the issues and priorities for further analysis, and major arterial and collector road restoration opportunities for each watershed within the sub-basin based on the following:
   a. Proportion and area of the watershed in riparian reserves.
   b. Road density within the riparian reserves (high = >2mi/mi^2, moderate = 1-2mi/mi^2, and low = <1 mi/mi^2).
   c. Proportion of major arterial and collector roads that occur in the riparian reserve.
4. Relative ranking. Based on the above information rank the watershed and major arterial and collector roads as follows:
   a. Low (2) – Low potential to restore riparian habitat and habitat connectivity.
   b. Moderate (6) – Moderate potential to restore riparian habitat and habitat connectivity.
   c. High (10) – High potential to restore riparian habitat and habitat connectivity.
   d. None (0) – Road not located in a riparian reserve.

Criterion 4: Ungulates

This group of wildlife species includes about 285 vertebrate species that are either directly dependent on riparian habitat or use them more than other habitats (Thomas et al. 1979). Road-associated factors that could affect these species include collisions, movement barriers, displacement/avoidance, habitat loss and fragmentation (USDA FS 1997, Singleton and Lehmkuhl 1998, Maxwell and Hokit 1999, Wisdom et al. 1999).

Questions Addressed

Affects of unique communities or special features (TW – 4)

Rating

4. The analysis area: The watersheds within the sub-basin.
5. Determine the area within riparian reserves and density of roads within riparian reserves.
6. Identify the issues and priorities for further analysis, and major arterial and collector road restoration opportunities for each watershed within the sub-basin based on the following:
   d. Proportion and area of the watershed in riparian reserves.
   e. Road density within the riparian reserves (high = >2mi/mi^2, moderate = 1-2mi/mi^2, and low = <1 mi/mi^2).
   f. Proportion of major arterial and collector roads that occur in the riparian reserve.
5. Relative ranking. Based on the above information rank the watershed and major arterial and collector roads as follows:
   e. Low (2) – Low potential to restore riparian habitat and habitat connectivity.
   f. Moderate (6) – Moderate potential to restore riparian habitat and habitat connectivity.
   g. High (10) – High potential to restore riparian habitat and habitat connectivity.
   a. None (0) – Road not located in a riparian reserve

Criterion 5: Unique Habitats

Unique habitats include wetlands, talus slopes, caves, cliffs, snag patches, hardwood forests, etc. These habitats tend to be used disproportionate to their availability on a landscape, making them particularly important for wildlife and greatly enhancing biodiversity. Road-associated factors that could affect the wildlife species associated with these habitats include collisions, movement

barriers, displacement/avoidance, habitat loss and fragmentation (U.S.D.A. Forest Service 1997, Singleton and Lehmkuhl 1998, Wisdom et al. 1999).

Questions Answered

Affects of unique communities or special features (TW-4)

Rating

1. The analysis area: the watersheds within the sub-basin.
2. Identify the unique habitats within each watershed.
3. Identify the issues and priorities for further analysis, and major arterial and collector roads restoration opportunities based on the following:
   a. The density of unique habitats (acres/mile road within 100m of major arterial and collector roads) within the watershed.
   b. The quantity of unique habitats (number of unique habitat types/road segment or road within 100m of Level 3-5 roads).
   c. Rating of unique habitats will be based on the following formula and then applied to relative ranking below:
      1) Low density + low quantity = low
      2) Low/moderate density + moderate quantity = moderate
      3) Moderate density + low/moderate quantity = moderate
      4) High/moderate density + high quantity = high
      5) High density + high/moderate quantity = high

      Determination of low/mod/high density and quantity will be a function of statistical distribution and ecological situation specific to each sub-basin.
4. Relative ranking. Based on the above information rank the watershed as follows:
   a. Low (2) – low density/quantity of unique habitats and low potential to restore unique habitats.
   b. Moderate (6) – moderate density/quantity of unique habitats and moderate potential to restore unique habitats.
   c. High (10) – high density/quantity of unique habitats and high potential to restore unique habitats.
   d. None (0) –Roads do not affect unique habitats.

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Table C-3. Results of roads analysis, rating and notes, for wildlife habitat on Tonasket Ranger District

Seg #	Road #	Watershed	Seg. lngth.	Wide ranging carniv.	LSR	Riparian depend.	Ungul.	Unique habitats	Wildlife total	Wildlife rating	Notes Abbreviations: Wide Ranging Carnivores= W, LSR = L, Riparian Depend.=R, Ungulates=U, Unique Hab.=UH
1	3000000	Tunk Creek	1.8	5	n/a	2	9	2	18	M	W-Near pvt. land, road density (RD)=moderate, would increase core and connect.; U-adj. & partly in winter range (WR), road bisects WR, snow part present, heavy snowmobile use.; R-not in rip.
2	3000000	West Fork San Poil River	14.1	9		6	5	6	26	H	W-core is very lit. and frag. Main arterial, would close lots of tributaries, other ways to access area, would add/create core, heavy winter snowmobile use, year round recc.; U-bisects WR, groomed snowmobile rte., transitory.; R-runs along Aeneas Ck. for about 2 miles.; UH-a few types, wetland, some hardwoods.
3	3010000	Bonaparte Creek	10.0	5		6	5	2	18	M	W-accesses pvt. land, subdivisions, not much core around it, could create isolated island of core, outside/borders LAU, very high RD and poor core so it needs help even though in pvt. land.; U-outside of deer WR, but surrounded by WR, snowmobiles, plowed to FS

Seg #	Road #	Watershed	Seg. lngth.	Wide ranging carniv.	LSR	Riparian depend.	Ungul.	Unique habitats	Wildlife total	Wildlife rating	Notes Abbreviations: Wide Ranging Carnivores= W, LSR = L, Riparian Depend.=R, Ungulates=U, Unique Hab.=UH
											boundary, fawning (F).; R-runs along Peony Ck.; UH-not much.
4	3010000	West Fork San Poil River	2.4	5		2	5	2	14	M	W-runs thru edge of LAU, still adj. to pvt. land, other adj. to public so increased potential for core.; U-ridge line for travel, connects larger areas of WR, road bisects the ridge.; R-a few crossings, not much rip.; UH-near wetland area, on pvt. land.
5	3015000	Bonaparte Creek	6.6	5		2	5	6	18	M	W-on edge of LAU, thru part, similar. to seg.3/4,low potential, on Pvt. land, bisects core.; U-same as seg. 3, on pvt. land.; R-upper stretch along Peony Ck., otherwise out of rip., along Chewiliken Ck., along pvt. (seg. is in Chewiliken Ck.).; UH-hardwood, hawk's nest.
6	3100000	Bonaparte Creek	2.6	1		2	1	2	6	L	W-close to pvt. land, won't gain much core.; R-not in rip.; U-on edge of WR, pvt., lots of snow.;
7	3100000	West Fork Granite Creek	4.8	5		10	5	10	30	H	W-in interior of Forest, in LAU, help to join small island of core.; R-in some rip.; U-goes thru WR, not great habitat.; UH-lots of goshawk

Seg #	Road #	Watershed	Seg. lngth.	Wide ranging carniv.	LSR	Riparian depend.	Ungul.	Unique habitats	Wildlife total	Wildlife rating	Notes Abbreviations: Wide Ranging Carnivores= W, LSR = L, Riparian Depend.=R, Ungulates=U, Unique Hab.=UH
											activity, deciduous forest.
8	3100000	West Fork San Poil River	11.1	5		6	5	6	22	H	W-parts in Maple LAU, not much core to be gained.; R-lower section in rip.; U-bisects WR.; UH-quite a bit of wetland, some decid.
9	3120000	West Fork San Poil River	8.3	9		2	9	10	30	H	W-main rd, links corridor between 2 LAUs.; R-out of rip.; U-in WR.; UH-wetlands, decid. forest, some bird breeding sites.
10	3125000	West Fork Granite Creek	4.8	5		2	9	2	18	M	W-in Maple LAU, not much core around.; R-not in rip.; U-in WR.
11	3200000	West Fork San Poil River	1.8	?	?	?	?	?		?	Could not find this road. delete.
12	3200000	Bonaparte Creek	1.8	5		2	1	10	18	M	W-paved. goes to Bonaparte Lk.-Beaver Lk., in Bon. LAU, better habitat, near large island of core, help improve link betwn Body and Bon. LAUs, would affect lots of tribs.; R-all developed.; UH-wetlands, breeding sites, decid. forest.
13	3200000	Toroda Creek	3.7	5		10	1	2	18	M	W-same as above.; R-follows creek.

Seg #	Road #	Watershed	Seg. lngth.	Wide ranging carniv.	LSR	Riparian depend.	Ungul.	Unique habitats	Wildlife total	Wildlife rating	Notes Abbreviations: Wide Ranging Carnivores= W, LSR = L, Riparian Depend.=R, Ungulates=U, Unique Hab.=UH
14	3230000	Antione Creek	4.3	9		6	5	2	22	H	W-in Bonaparte LAU, could link core across saddle.; R-runs along ck., close in only a few places. U-goes into WR.
15	3230000	Bonaparte Creek	0.7	9		2	1	6	18	M	W-in Bon. LAU, main road, affect lots of tribs., could increase core.; R-not much.; UH-lots of deciduous.
16	3230000	Bonaparte Creek	4.6	9		2	1	6	18	M	same as above
17	3230000	Siwash Creek	6.1	9		2	9	6	26	H	W-in Bon. LAU, main rd thru there, connect core.; R-crossings but they are high.; U-lots of lodgepole, in WR.; UH-deciduous forests, goshawk activity.
18	3235000	Antione Creek	1.6	1		6	9	2	18	M	W-edge of Bon. LAU, lot of pvt. land right around it.; R-crossings but mostly side slope.; U-in WR, snowmobile trail.
19	3235000	Siwash Creek	3.4	5		2	9	10	26	H	W-into Bon. LAU, could add core to small islands.; R-some crossings, higher.; U-in WR.; UH-lots of decid., bird breeding sites.
20	3240000	Bonaparte Creek	0.8	5		2	1	2	10	L	W-in Bon. LAU, not much core to be gained.; R-not much.
21	3240000	Toroda Creek	6.8	9		2	9	10	30	H	W-also in Bon. LAU, could create a lot of core, main road.; R-some crossings, not really in rip.; U-end goes into good WR.; UH-goes to

Seg #	Road #	Watershed	Seg. lngth.	Wide ranging carniv.	LSR	Riparian depend.	Ungul.	Unique habitats	Wildlife total	Wildlife rating	Notes Abbreviations: Wide Ranging Carnivores= W, LSR = L, Riparian Depend.=R, Ungulates=U, Unique Hab.=UH
											Virginia Lily trail, unique site, interpretive trail.
22	3300000	Antione Creek	2.9	1		2	1	2	6	L	W-on edge of LAU, runs through pvt.; R-not in rip.; U-little WR.; UH-some wetlands/decid. on pvt.
23	3300000	Myers Creek	2.4	1		2	1	6	10	L	W-parts in Bon. LAU, lot of open country, not much timber, pvt. land.; R-a few spots/crossings.; U-little WR.; UH-some deciduous, wetlands, raptor activity on west end.
24	3300000	Myers Creek	5.2	1		2	1	6	10	L	same as above.
25	3300000	Toroda Creek	4.5	5		2	5	2	14	M	W-in Bon LAU, could connect small islands of core.; R-not much.; U-little WR, actually a corridor used in winter, not mapped.
26	3400000	Myers Creek	1.7	5		6	1	6	18	M	W-next to tiny island of core, small bit in Bon. LAU; R-along rip area.; UH-out to wetlands.
27	3525000	Antione Creek	6.4	1		6	1	10	18	M	W-lot of pvt. land, Mt. Hull, very isolated.; R-goes by some ponds, lakes.; UH-mines, decid., wetlands, raptor activity, historical beaver activity.

Seg #	Road #	Watershed	Seg. lngth.	Wide ranging carniv.	LSR	Riparian depend.	Ungul.	Unique habitats	Wildlife total	Wildlife rating	Notes Abbreviations: Wide Ranging Carnivores= W, LSR = L, Riparian Depend.=R, Ungulates=U, Unique Hab.=UH
28	3525000	Tonasket Creek	4.8	1		2	1	2	6	L	W-Mt. Hull, very isolated, surrounded by pvt. land.; R-a few crossings.
29	3550000	Toroda Creek	7.9	9		10	9	2	30	H	W-bisects good chunk of core.; R-up the gut.; U-in WR.
30	3575000	Myers Creek	8.9	5		2	5	6	18	M	W-pvt. land, not much core to be gained.; R-a few crossings.; U-near WR.; UH-a few raptor breeding sites.
31	3575000	Toroda Creek	5.7	1		10	5	2	18	M	W-lower part near section of core, lots of pvt.; R-follows ck.; U-thru a little WR.; UH-decid. on pvt.
32	3700000	Salmon Creek	5.2	9		2	5	6	22	H	W-main rd., could substantially increase core, close lots of tribs.; R-paved, on slope.; U-lot of moose in basin, should be deer WR (not mapped).; UH-little deciduous, some avalanche chutes, talus.
33	3700000	Salmon Creek	9.5	9		6	5	6	26	H	W-same as above, grizzly/wolf sightings.; R-middle section in /out of rip.; UH-same as above.
34	3800000	Salmon Creek	0.3	9		2	5	2	18	M	W-could increase core, close lots of tribs in NF Salmon Ck LAU.; R-out of rip.
35	3800000	Salmon Creek	6.4	9		10	5	2	26	H	W-same as above.; R-up the gut.; U-migration corridor, especially near upper end.; UH-small wetland, some decid.

Seg #	Road #	Watershed	Seg. lngth.	Wide ranging carniv.	LSR	Riparian depend.	Ungul.	Unique habitats	Wildlife total	Wildlife rating	Notes Abbreviations: Wide Ranging Carnivores= W, LSR = L, Riparian Depend.=R, Ungulates=U, Unique Hab.=UH
36	3810000	Salmon Creek (+Tunk)	3.2	9		6	9	6	30	H	Road accesses state land and lookout. W-same as above.; R-along a small ck.; U-on ridge line, migration.; UH-decid., aspen, raptor activity.
37	3900000	Similkameen River	19.1	9		6	9	10	34	H	W-major access, good habitat, grizzly sightings, would add a lot of core.; R-some sections along wetlands.; U-big potential for disturbance, snowmobilers, possible access to mtn. goats.; UH-lots of wetlands, aspen.
38	3900000	Similkameen River	1.9	9		6	9	10	34	H	added this segment to Salmon Creek segment.
39	4200000	Salmon Creek	2.6	9		10	1	2	22	H	W-main artery going South, create lots of core, lynx/wolf/grizzly habitat, in LAU.; R-up the gut.; UH-some decid.
40	4200000	Salmon Creek	0.1	9		10	1	2	22	H	same as above
41	4200000	Salmon Creek	1.7	9		10	1	2	22	H	same as above
42	4200000	Salmon Creek	1.3	9		10	1	2	22	H	same as above
			Mean	6.07		4.83	4.51	4.83	20.24		

Table C-4. Road density of each Lynx Analysis Unit (LAU) on the Methow and Tonasket Sub-basins

LAU	Road length (miles)	Total area (acres)	Total area (mi^2)	Road density (mi/mi^2)
Andrews Creek	0	21,851	34.1	0.0
Apex Mountain	0	30,575	47.8	0.0
Bald Mountain	0	35,776	55.9	0.0
Big Craggy Peak	67.7	26,021	40.7	1.7
Blue Buck Ridge	52.1	26,847	41.9	1.2
Bodie*	7.7	3,431	5.4	1.4
Bonaparte	137.6	44,137	69.0	2.0
Buckskin Ridge	0.3	37,123	58.0	0.0
Bunker Hill	0	34,977	54.7	0.0
Cascade Pass	0	43,467	67.9	0.0
Cecile Creek	101.4	43,307	67.7	1.5
Chocolate Glacier	0	37,227	58.2	0.0
Cooper Mountain*	39.8	28,382	44.3	0.9
Copper Peak*	0	35,383	55.3	0.0
Crescent Mountain	2.6	23,010	36.0	0.1
Dugout*	9.7	3,795	5.9	1.6
Eureka Lake	0	31,960	49.9	0.0
Farewell Peak	37.6	41,227	64.4	0.6
Ferry Peak	0	25,809	40.3	0.0
Fourth of July Basin*	0	37,720	58.9	0.0
Frisco Mountain	6.4	54,321	84.9	0.1
Frosty Lake	0	19,940	31.2	0.0
Glory Mountain	0	50,553	79.0	0.0
Granite Creek	16.7	46,330	72.4	0.2
Halfmoon Lake	2.2	27,886	43.6	0.1
Hancock Ridge	9.3	38,275	59.8	0.2
Horseshoe Creek	0	26,526	41.4	0.0
Hozomeen	0	24,522	38.3	0.0

LAU	Road length (miles)	Total area (acres)	Total area (mi^2)	Road density (mi/mi^2)
Hungry Ridge*	23.2	27,769	43.4	0.5
Image Lake	0	29,704	46.4	0.0
Indianhead Basin*	0	31,711	49.5	0.0
Lease Creek	0	33,906	53.0	0.0
Many Traits Creek	0	21,594	33.7	0.0
Maple	61.6	32,884	51.4	1.2
Mazama	18.8	33,871	52.9	0.4
Methow Gold Creek	14.7	29,583	46.2	0.3
Middle Fork Boulder Creek	24.7	27,682	43.3	0.6
Milton Mountain	5.8	32,164	50.3	0.1
Monument Creek	3.1	28,115	43.9	0.1
Mount Blackenship	0	46,752	73.0	0.0
Nanny Goat Mountain	0	28,125	43.9	0.0
North Fork Boulder Creek	30.5	15,594	24.4	1.3
North Fork Salmon Creek	58.6	24,795	38.7	1.5
North Fork Toats Coulee	0	42,256	66.0	0.0
Nohokomeen Glacier	0	27,512	43.0	0.0
Pugh Ridge	0	31,273	48.9	0.0
Purple Mountain	0	24,810	38.8	0.0
Rabbit Ridge	30.2	22,711	35.5	0.9
Sandy Butte	5.6	27,751	43.4	0.1
South Fork Beaver Creek	77.1	19,872	31.1	2.5
South Fork Toats Coulee	23.6	20,168	31.5	0.7
Slate Creek	16.8	54,861	85.7	0.2
Spectacle Buttes	0	28,965	45.3	0.0
Snowshoe Ridge	2.9	25,965	40.6	0.1
Spirit Mountain	19.2	23,275	36.4	0.5
Swan*	30	8,487	13.3	2.3
Thirtymile Peak	15.9	26,431	41.3	0.4
Three Fools Creek	0	44,100	68.9	0.0
Thunder Creek	0	29,053	45.4	0.0

LAU	Road length (miles)	Total area (acres)	Total area (mi^2)	Road density (mi/mi^2)
Trinity	0	44,864	70.1	0.0
Tunk	91.1	27,042	42.3	2.2
Twisp	36.2	31,476	49.2	0.7
West Fork Salmon Creek	57.8	27,936	43.6	1.3
Whiteface Creek	56.8	27,651	43.2	1.3
Yarrow Creek	17	27,110	42.4	0.4

* Part of LAU is located on the Entiat/Chelan Sub-Basins or the Colville National Forest. These figures do not include areas on the Entiat/Chelan Sub-Basins or the Colville National Forest.

Appendix D

Recommended management actions are possible options to meet the needs of the resources and the public. Any single action or combination of actions could be used. This analysis will give the broad category and the District will need to decide which actions are appropriate for each project.

The possible management actions that were considered are:
Action A: Access needs to be maintained due to public needs; however, some major work or restrictions are needed to mitigate the resource impact. Options include but are not limited to: relocation, major rehabilitation such as raising grade, surfacing, installing a large CMP or bridge, major storm-proofing (investment needed, time, and money).

Action B: Access needs to be maintained due to public needs; however, some minor work or restrictions are needed to mitigate the resource impact. Options include but are not limited to: seasonal restrictions or gating entrance, minor ditch work, adding small CMP, improved or more frequent maintenance, minor storm proofing (only enough work to address critical rating element).

Action C: Due to limited access needed and minimal resource impact, these are candidates to leave as is, maintenance continues as is.

Action D: Access needs to be maintained due to limited public or resource needs; there is little or no resource impact, so it would be possible to reduce the maintenance level.

Action E: Access may be available but due to budget constraints and minimal resource impact, these are candidates to stop maintaining after putting in a self-maintaining status.

Action F: Access does not need to be maintained and some form of decommissioning to provide ecosystem restoration would mitigate resources impact. Options include but are not limited to: blocking the entrance (includes gating for other than annual type seasonal use), rip & seed, removing culverts, partial or full obliteration.

Quandary: This is for segments when there are conflicting management recommendations.

Resolve all possible recommendations within the team. All quandaries: write up why it is a quandary and present to line officer. Also provide short write-up for each priority project, include: description, location, short and long term alternatives if needed.

Table D-1. Ratings and recommended management actions, alternatives

Aquatic rating	Wildlife rating	Human use rating	Recommended mgmt.
High	High	High	A
High or Moderate	High or Moderate	Low	E
Moderate	Moderate	Moderate	Quandary
Low or Moderate	Low or Moderate	High	B or D
Low	Low	Moderate	C
Low	Low	Low	D or E
High	Low or Moderate	High	A
Low or Moderate	High	High	A

Table D-2. Road analysis recommended management actions, Tonasket Ranger District

Road seg #	Watershed	FS rd #	Road name	Cost share	Seg. lgth	Aquatic rating	Wildlife rating	Human use rating	Draft recom. mgmt	Curr. maint. level	Current maint. cost	Prop. maint. level	Cost to maint.	Final recom. mgmt.	Potential PFSR Y/N	Priority /Remarks
1	Tunk Creek	3000000	Aeneas		1.8	L	M	H	C	3	6,840	3	6,840	C	Yes	
2	West Fork San Poil River	3000000	Aeneas		14.1	L	H	H	C	3	53,580	3	53,580	C	Yes	
3	Bonaparte Creek	3010000	Peony Creek		10.0	L	M	H	C	3	38,000	3	38,000	C	Yes	
4	West Fork San Poil River	3010000	Peony Creek		2.4	L	M	H	C	3	9,120	3	9,120	C	Yes	
5	Bonaparte Creek	3015000	Sneed Bench		6.6	L	M	H	C	3	25,080	3	25,080	C	Yes	
6	Bonaparte Creek	3100000	Fir Creek		2.6	L	L	M	C	3	9,880	3	9,880	C	Yes	
7	West Fork Granite Creek	3100000	Fir Creek	X	4.8	L	H	H	C	3	18,240	3	18,240	C	Yes	
8	West Fork San Poil River	3100000	Fir Creek		11.1	L	H	M	D	3	42,180	2	11,211	D	Yes	
9	West Fork San Poil River	3120000	Coco Mtn.		8.3	L	H	H	C	3	31,540	3	31,540	C	Yes	See notes in Table D-3.
10	West Fork Granite Creek	3125000	Gardner		4.8	L	M	H	C	3	18,240	3	18,240	C	Yes	
11	~~West Fork San Poil River~~	~~3200000~~	Gardner		~~1.8~~	~~0~~	0	0					4,140		Yes	

Road seg #	Watershed	FS rd #	Road name	Cost share	Seg. lgth	Aquatic rating	Wildlife rating	Human use rating	Draft recom. mgmt	Curr. maint. level	Current maint. cost	Prop. maint. level	Cost to maint.	Final recom. mgmt.	Potential PFSR Y/N	Priority /Remarks
12	Bonaparte Creek	3200000	Bonaparte		1.8	L	M	H	C	4	4,140	4	4,140	C	Yes	
13	Toroda Creek	3200000	Bonaparte		3.7	M	M	H	C	4	8,510	4	8,510	C	Yes	See notes in Table D-3.
14	Antione Creek	3230000	Mill Creek		3.7	L	H	H	C	3	14,060	3	14,060	C	Yes	14
15	Bonaparte Creek	3230000	Mill Creek	X	0.7	L	M	H	C	4	1,610	4	1,610	C	Yes	15
16	Bonaparte Creek	3230000	Mill Creek	X	4.6	L	M	H	C	3	17,480	3	17,480	C	Yes	16
17	Siwash Creek	3230000	Mill Creek		6.1	L	H	M	C	3	23,180	3	23,180	C	Yes	17
18	Antione Creek	3235000	Phoebe		1.6	L	M	H	C	3	6,080	3	6,080	C	Yes	18
19	Siwash Creek	3235000	Phoebe		3.4	L	H	M	D	3	12,920	2	3,434	D	Yes	19
20	Bonaparte Creek	3240000	Cumberland		0.8	L	L	M	C	3	3,040		1,840	C	Yes	20
21	Toroda Creek	3240000	Cumberland		6.8	L	H	H	C/D	3	25,840		15,640	C/D	Yes	21
22	Antione Creek	3300000	Box Canyon	X	2.9	L	L	H	C	4	6,670		6,670	C	Yes	22
23	Myers Creek	3300000	Box Canyon	X	2.4	L	L	H	C	4	5,520		5,520	C	Yes	23
24	Myers Creek	3300000	Box Canyon	X	5.2	L	L	L	C	3	19,760		11,960	C	Yes	
25	Toroda Creek	3300000	Box Canyon		4.5	L	M	M	C	3	17,100		10,350	C	Yes	
26	Myers Creek	3400000	Lake		1.7	L	M	L	D	3	6,460	2	1,717	D	Yes	
27	Antione Creek	3525000	Summit Lake		6.4	L	M	H	C	3	24,320		14,720	C	Yes	

Road seg #	Watershed	FS rd #	Road name	Cost share	Seg. lgth	Aquatic rating	Wildlife rating	Human use rating	Draft recom. mgmt	Curr. maint. level	Current maint. cost	Prop. maint. level	Cost to maint.	Final recom. mgmt.	Potential PFSR Y/N	Priority /Remarks
29	Toroda Creek	3550000	Marias Creek		7.9	M	H	M	B/D	3	30,020	2	7,979	B/D	No	See notes in Table D-3.
30	Myers Creek	3575000	Nicholson Creek		8.9	M	M	H	B	3	33,820		20,470	B	Yes	See notes in Table D-3.
31	Toroda Creek	3575000	Nicholson Creek		5.7	M	M	H	B	3	21,660		13,110	B	Yes	See notes in Table D-3.
32	Salmon Creek	3700000	Middle. Salmon Boulder	X	5.2	L	H	M	C	4	11,960		11,960	C	Yes	
33	Salmon Creek	3700000	Middle Salmon Boulder		9.5	L	H	M	C	3	36,100		21,850	C	Yes	
34	Salmon Creek	3800000	Salmon Meadows		0.3	L	M	M	C	3	1,140		690	C	Yes	
35	Salmon Creek	3800000	Salmon Meadows	X	0.3	H	H	H	A	4	690		690	A	Yes	See notes in Table D-3.
36	Salmon Creek	3810000	Gibson Creek	X	3.2	M	H	H	C	3	12,160		7,360	C	Yes	See notes in Table D-3.
37	Similkameen River	3900000	Meadows Toats		19.1	L	H	H	C	4	43,930		43,930	C	Yes	
38	Similkameen River	3900000	Meadows Toats		1.9	M	H	L	B	3	7,220		4,370	B	Yes	See notes in Table D-3.
39	Salmon Creek	4200000	South Fork Salmon		2.6	L	H	L	A	2	2,626	3	9,880	A	Yes	See notes in Table D-3.
40	Salmon Creek	4200000	South Fork Salmon		0.1	M	H	H	D	5	230	3	380	D	Yes	See notes in Table D-3.
41	Salmon Creek	4200000	South Fork Salmon		1.7	H	H	L	D	4	3,910	3	6,460	D	Yes	See notes in Table D-3.
42	Salmon Creek	4200000	South Fork Salmon		3.4	M	H	H	B	3	12,920		7,820	B	Yes	See notes in Table D-3.
					199.2					**Total ($k)**	**686**	**Total ($k)**	**541**			

Table D-3. Roads analysis recommended management actions, Tonasket Ranger District notes

Road seg. #	Remarks & recommendations Abbreviations: (WL) = wildlife concerns, (AQ) = aquatic concerns
9	Consider reducing/eliminating grooming to reduce impacts to ungulates winter range (WL)
13	Consider installing a silt fence full length of road when resurface (AQ)
14	Consider reducing grooming to reduce impacts to ungulates winter range (WL)
21	Reduce to a maintenance level 2 above trailhead (approx. last 3 miles)
29	Stabilize ditches and culverts and look at potential flow problems
30	Stabilize ditches and culverts and look at potential flow problems
31	Stabilize ditches and culverts and look at potential flow problems
35	Manage dispersed recreation access off road; install side drains; repair slump areas
36	First mile of road is very high maintenance.
38	Add culverts at meadows and slumps to dissipate water
39	Segment is in core habitat (WL); there are riparian issues; however, no feasible fix (WL); good candidate for relocation; there are political issues (AQ)
39	Safety concerns due to width; raise to level 3;concerns to carnivores with increased access (WL)
40	Segment is in core habitat (WL), are riparian issues; however, no feasible fix (WL); consider grinding up AC and reduce to maintenance level 3
41	Segment is in core habitat (WL); there are riparian issues; however, no feasible fix (WL); road is along stream; consider relocation (AQ)
42	Segment is in core habitat (WL); there are riparian issues; however, no feasible fix (WL); improve ditches and culverts (AQ)

Appendix E

Public Input to Road Analysis

Tonasket Ranger District

Tonasket Ranger District and other Okanogan & Wenatchee National Forests personnel conducted a public meeting on March 29, 2001 to explain our current roads analysis and fire planning processes. Listed below are the comments and questions received during the meeting. When possible, Forest Service personnel provided answers. Also included are comments received at the District from comment cards mailed in after the meeting.

Comments during meeting

Gold Creek Road (Methow Ranger District): How can the public get the maintenance level of Forest roads improved? It was pointed out that Gold Creek Road might be a candidate for County maintenance as a Public Forest Service Road (PFSR). There may be an opportunity for the county to receive additional funding to maintain such roads.

A concern was voiced that any level 3 roads reclassified to level 2 would eventually be closed. It was pointed out that the current planning and analysis are focused on arterial and collector roads. The likelihood that any arterial or collector roads would be closed in the foreseeable future is very low.

A concern was voiced that the Forest Service should work harder to secure more appropriated funds for road maintenance. It was stated that the likelihood that road maintenance funding would increase in the near future is low.

A concern was voiced that timber sales help finance road maintenance and should be pursued more aggressively by the Forest Service. The Forest Allowable Sale Quantity (ASQ) was discussed briefly. It was also pointed out that timber sale programs had declined, in part, in response to environmental constraints mandated by law to protect wildlife species and habitats.

A participant inquired whether more of the costs associated with road maintenance should be put on timber purchasers. Road maintenance requirements in timber sale contracts were briefly explained.

A concern was voiced that access for administration of active permits be considered in the criteria for assessment of road maintenance levels. Some high clearance vehicle roads are not suitable for horse trailers. Road 3800-365 was cited as one example where level 2 might not work. Forest Service personnel noted that permittee access is customarily considered in any decisions or analyses concerning access. The concern pertinent to Road 3800-365 was noted.

Concern was voiced about continued maintenance of “alpine” roads (that is, higher elevation roads) where most recreation takes place. It was noted that user access is one of the criteria that

will be weighed when ratings are assigned to individual roads.

Concern was voiced pertinent to Department of Natural Resources (DNR) road closures in the Toats Coulee area and restricted access to firewood. In one opinion, the closures are not fair to the public. Marge Hutchinson noted that maintenance of private, state, and county roads is not within the jurisdiction of the Forest Service. It was stated that it would be highly unlikely that the Forest Service Toats Coulee Road 39 would be closed in the foreseeable future. Access to firewood in that area is limited to mostly the areas adjacent to Road 39.

Concerns were voiced about closure of roads in general. Marge Hutchinson and other Forest personnel reminded meeting participants that the current roads analysis process is not a decision process. Again, it was stated that road closures would not likely occur as a direct result of the current process.

Carl Bjelland requested a copy of the Road Rating Criteria. Marge Hutchinson and Michael Alvardo said they would send the criteria to him.

Concern and disappointment were voiced that the down/dead trees adjacent to Road 3230 near Lightning Creek and on the back (south) side of Mt. Anne were not used as commercial timber and are not readily available as firewood. Michael was familiar with the Lightning Creek blow-down timber, and he noted that salvage plans were compromised by riparian habitat management direction. Michael was not aware of the blow-down south of Mt. Anne.

The opinion that reduced maintenance levels would be acceptable on some roads was expressed. Marge Hutchinson stated that identifying which roads would be the best candidates for reduced maintenance level is the primary objective of the current roads analysis process.

One participant asked whether any NEPA decisions would result from the current roads analysis process. Marge Hutchison stated that recommendations, rather than decisions, would result from the current roads analysis process. Future decisions will depend on specific projects and funding availability.

A concern was voiced that public access to firewood should be among the human use criteria for road maintenance or closure recommendations.

A question was asked about the source of funding for road maintenance and roads analysis. Marge explained that the Forest Service obtains most funds used for road maintenance work through Congressional appropriations.

Input from Comment Cards

When you get into the watershed and project levels of road analysis, please consider the fact that many of the “Baby Boomers” are quickly losing their ability to use the Forest by hiking or biking into road restricted areas. This fact is going to increase pressure in whatever areas have roads available for public uses (that is, fewer roads available to more people). Is this going to lead to a reservation system? Unfortunately, you detect distrust. We need to address the future uses by people. The scoring system has two areas for nature and only one for people. How will the

math work out? People will lose! This is not a fair rating system. Please think about it. Is there another way?

Roads 3700000, 3700100, 3800000, 3800025, 3800027, and 4200000: Kevan Roberts (of WA Department of Natural Resources (DNR), Box 190, Colville, WA 99114) commented that maintenance decisions made on these roads may have an impact on management activities on State lands. Representing the DNR, Kevan requested to be informed of any decisions made concerning these roads. He also requested that the DNR be informed of decisions or recommendations made on roads not covered at this meeting that would affect management of State lands.

Gerald Scholz commented that the following roads need to be maintained for permittee management operations: 3810000, 3810100 (section 1), and 3810100 (section 2). Maintenance level 2 might not work with horse trailers in some locations.

Randy Pancerzewski commented that he would support moving the following roads to Level 2 maintenance: 3524100 and 3525.

One meeting participant made the following comments:
Retain maintenance at current levels for passenger cars on the following roads:
30 (upgrade if funds become available), 3000400, 3010000 (joint with County), 3015000, 3100000, 3115100, 3120000 (50% with County), 3120020, 3125000, 3200000, 3200050, 3230000, 3235000, 3240000, 3240020 (joint with County), 3300000, 3400000, 3525000, 3575000, 3700000, 3700100, 3700130, 3700300 (50% with County), 3700400 (to Wagon Camp), 3700500, 3800000, 3800025, 3803100 (Conconully Visitor Center), 3810000, 3810100, 3900000, and 4200000.

The same participant commented that reducing maintenance to Level 2 would be acceptable on the following roads:
3000100, 3000200, 3000500, 3000600, 3005100, 3005200, 3010200, 3100200, 3100300, 3150100 (50% with County), 3200050, 3300100, 3524100, 3800200 (keep open), 3900300, 4200300 and 4200400.

Interested Parties Public Involvement

Tonasket Road Analysis

The following is a list of interested parties. These individuals, agencies and organizations expressed interest either through attendance at public or agency meetings, or responded with comments.

Beeman, Jerry L.
Bjelland, Carl
Bjelland, Chris
Bonnin, Frank
Estey, Brian
Holbrook, Keith & Theda

Jones, PeeWee & Glenna
High, James
Morris, Mel
Myers, Jim & Jean
Pancerzewski, Randy
Porter, G.S.
Roberts, Kevan
Scholz, Gerald
Stansbury, Chad
Wonch, Ron

Appendix F: Definitions

Classified Road: Roads, wholly or partially within or adjacent to National Forest System lands, that are determined to be needed for long-term motor vehicle access, including state roads, county roads, privately owned roads, National Forest System roads, and other roads authorized by the Forest Service.

Road: A vehicle travel-way more than 50 inches wide unless designated and managed as a trail. A road may be classified, unclassified, or temporary.

Road Decommissioning: Activities that result in the stabilization and restoration of unneeded roads to a more natural state.

Road Maintenance: The ongoing upkeep of a road necessary to retain or restore the road to the approved road management objective.

Road Maintenance Levels:

1 - Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed one year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities.
2 - Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration.
3 - Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities.
4 - Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Dust abatement is a consideration.
5 - Assigned to roads that provide a high degree of user comfort and convenience.

Road Reconstruction: Activities that result in improvements or realignment of an existing classified road.

Roads Subject to Highway Safety Act: National Forest System roads that are open to use by the public for standard passenger cars. This included roads with access restricted on a seasonal basis and roads closed during extreme weather conditions or for emergencies, but which are otherwise open for general public use.

Temporary Roads: Roads authorized by contract, permit, lease, other written authorization, or emergency operation, not intended to be part of the forest transportation system and not necessary for long-term resource management.

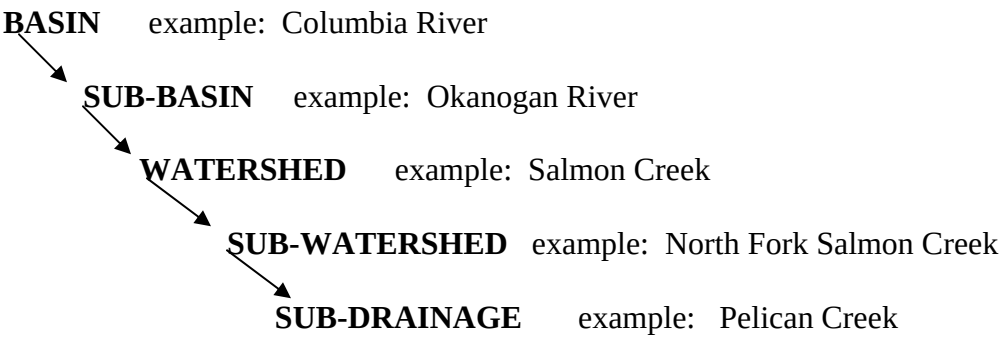
Unclassified Roads: Roads on National Forest System lands that are not managed as part of the forest transportation system, such as unplanned roads, abandoned travel-ways, and off-road vehicle tracks that have not been designated and managed as a trail; and those roads that were

once under permit or other authorized and were not decommissioned upon the termination of the authorization.

Unroaded Areas (Roadless): Areas that do not contain classified roads.

Watershed Scale: A watershed is the area drained by a distinct stream or river system and separated from other similar systems by ridge top boundaries. Watersheds catch and store precipitation, releasing the stored water to the stream channel.

Watershed Hierarchy: The terms "watershed," "basin," "sub-basin," "sub-watershed," and "sub-drainage" are used to describe a hierarchy of "watershed" areas that have been established by the Forest Service and other agencies. The hierarchy is as follows:



Terms Used in Wildlife Rating Criteria

Impassable road: Roads that are not reasonably or prudently passable by conventional four-wheeled passenger vehicles, motorcycles, or all terrain vehicles.

Open road: Roads open to motorized use during any portion of the season of concern for the particular species being addressed. If information is not available concerning the effectiveness of a gate or berm it may be best to assume it is open.

Restricted road: Roads that are legally restricted, typically with gates or berms and for which information is available showing that use does not exceed 14 days.